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About the Journal

CLOUD is the official journal of the student research outputs or capstone projects of the Information Technology Education Program of the University of the Immaculate Conception. This journal is published annually, and is composed of research outputs or capstone projects from three different courses offered under the ITE Program: BS in Computer Science, BS in Information Technology (Specialized in Software Engineering, Multimedia, and Computer Networking), and BS in Information Systems.

Eric John G. Emberda, MIM
Coordinator - IT Development and Incubation Facility
Dean - ITE Program

About the Title

The term Cloud (in Cloud Computing) is used as a symbol for the Internet, based on how it is depicted in computer network diagrams and is an abstraction for the different technological infrastructure it encompasses. The Internet is the most significant output of computing which helped the world harness the power of information. Like the Cloud, the ITE Program is composed of different elements that come together to produce scientific researches that help improve the community in the information age.

Eric John G. Emberda, MIM
Coordinator - IT Development and Incubation Facility
Dean - ITE Program

About the Cover

The Cloud is an element of nature that brings about a multitude of phenomena all throughout the world. It brings with it, winds that merit change in the landscape, rain that sustains the growth of life, and the ability to influence the weather; be it in our favor or not. Like the cloud, the Internet, a vast network that connects us all on a global scale, acts as a great medium of change in the world and sustenance of life through the numerous technological advancements it brings.

The cover is an illustration of the cloud as a symbol of the internet. Just as countless clouds gather over the skies and give us benefits a many, such is the purpose of the internet as it gathers and collates information for various uses that help ease our day to day lives.

Mr. Dustin Hyrel Lim
ITE Program, Faculty
Cloud, Cover Layout Artist

EDITORIAL BOARD

PREFACE

It is with much joy and excitement that a new issue of the CLOUD journal is released. Together with the editorial board members of this journal we are delighted to showcase the research outputs of the students of the Information Education Technology program of this University. This issue is composed of a compilation of research abstracts of the students, including six selected full-text research papers. As an innovation of the previous issue released, we have grouped the studies into four areas namely:

Educational Technologies

These are research projects that focus on the design and development of innovative applications that aim to improve the quality of teaching and learning with the aid of technology.

Algorithms, Computation Theory, and Applied Computing Technologies

Research projects in this area focus on optimizing the underlying theories, algorithmic foundations, including the implementation and application of information and computing solutions.

Networking Technologies

Research projects in this area are focused (but are not limited)on the design, development, and management of networking infrastructure.

Entertainment and MultimediaTechnolgies

Research projects under this area involve the application of the fundamentals to advanced theories in the game design, scientific simulations, use and development of gaming technology and tools that will be used for entertainment and scientific applications.

MS. KRISTINE MAE M. ADLAON
UIC-ITE Research-in-Charge
ITE Students' CLOUD

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A 3D WEB BASED INTERACTIVE VIRTUAL TOUR OF THE UNIVERSITY OF THE IMMACULATE CONCEPTION (FR. SELGA CAMPUS)

Jomar Enrico Amador, Luigi Vernon Cawaling,
Robert Michael Cusap, Redentor Sandino Genotiva,
Daniel Ryan Quiño

ABSTRACT

A school website is a very important tool in advertising a specific school. A good website has a great layout, good navigation, professional appearance, and good content. However, it lacks one important aspect that is supposed to draw traffic, interactivity. In this regard, the researcher was motivated to implement a 3D Interactive Virtual Tour to address the issue. The goal is to upgrade the traditional website that is currently running in the school. In order to achieve the desired objective, the researchers used the constructive research approach for the study and iterative process model for the software development. The researchers used a survey in validating the effectives of the study. The researchers conducted a test on 4th year students from Davao City National High School, UIC Bonifacio Campus and few selected parents from EMCOR. The results of the respondent's feedback showed that they found that the application has excellent functionality. The results also show the impact of the application and acquired a very good rating from the respondents. The results of the testing implies that by using this system, on the UIC website, will help in providing more information regarding their facilities and amenities they have and that they offer to incoming college students or parents who are looking for an institution for their children.

Keywords: *Website, advertising, 3D interactive virtual tour*

INTRODUCTION

A school website is a very important marketing tool used by schools for promoting their institution to everyone. It gives the institution a means to spread their ideals, goals, facilities, and other school information. A well informed website helps the students or parents to know the services that the school can offer.

A good example of a well-informed school website is to have a virtual school tour section, where the visitor can view the school premises. The traditional way of doing this is to provide images of the school building and their different facilities. But this method only shows a small area of the premises and doesn't provide different view angles of the place and limits the freedom of the user to navigate the premises which affects the overall interactive experience of the user.

Based on the researchers' research, there are few schools in the Philippines that offer a 3D interactive web-based tour of their school building and facilities on their web page. For that, if allowed, we plan to implement our 3D interactive web-based tour of the University of the Immaculate Conception on their school website. Our goal is to expand the experience of the visitors and future UICians by providing them a way to view the UIC school buildings and facilities in a 3D form, were the visitors will have the ability to view the UIC campus and examine the different kinds of facilities available for the students in any angle they want.

The purpose of this study is to set a new and improved way in promoting a school using a 3D Web-Based Interactive Virtual Tour for the University of the Immaculate Conception (Father Selga Campus).

The study is intended to promote the institution and its facilities and to upgrade the method of school promotion that is unique and fits to the new generation.

Objectives of the Study

The general objective of the study is to create a 3D web-based interactive virtual tour of the University of the Immaculate Conception (Father Selga Campus). The proposed study is aimed to provide a virtual map to guide the incoming first year students around the campus to introduce the different facilities available for them inside the UIC Father Selga campus. The proposed study is a means to upgrade the current virtual campus tour used in the UIC website to a 3D web-based interactive virtual tour. This study will also provide a virtual tour to students currently enrolled in courses at UIC Bonifacio campus. And also to provide a virtual tour to parents and guardians of the students to inform them the environment their children are in.

Conceptual Framework

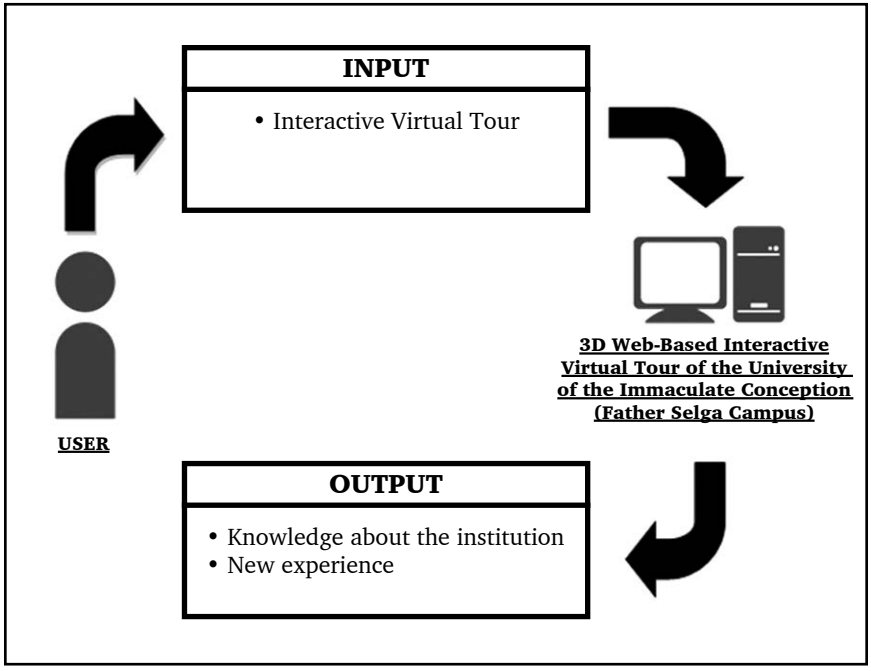

Figure 1. Conceptual Framework of the Study

The study's conceptual framework shows the separated ¬input and output of the proposed system. The input variable serves as the objective in developing the proposed application and the output variable which stated the list of outcomes the researchers wants to achieve from the user.

By using the proposed system, the user can interact and move around on the 3D Father Selga campus by using a default character with a 3rd person view while roaming around the quadrangle and around the lobby and a 1st person view while in the hallways and inside the rooms accessible by the students. The user then can choose to access the room or laboratory information's by stepping inside the facility.

METHODS AND MATERIALS

The researchers used the Constructive research approach. This method is intended to solve real world problems in the computing discipline.

Rapid Application Development (RAD) is an incremental process model that emphasizes a short development cycle. Uses high speed adaptation of waterfall model in which rapid development is achieved using a component based construction approach. This can quickly give the customer something to see and use and to provide feedback regarding the delivery and their requirements.

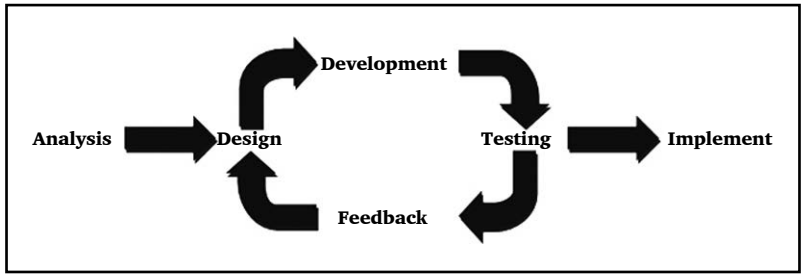

Figure 2. RAD Process Model

RESULTS AND DISCUSSION

The researchers conducted a test among 4th year students from Davao City National High School, UIC Bonifacio Campus and few selected parents from EMCOR. The respondents were carefully categorized for tallying the results. The objective was to determine if the web-based application would be helpful or useful for them. Presented below is the total population of those who participated on the survey.

Table 1. Total number of respondents

Group	Total Respondents
High School Students	20
Bonifacio Campus Students	20
Parents	10

The presented tables below show the results of the testing from the groups of high school students from Davao City National High School, UIC Bonifacio campus students and selected parents from EMCOR.

Table 2. Results of the system testing from the high school students

High School Students	5	4	3	2	1	Total
Question 1	10%	55%	35%			100%
Question 2	55%	30%	5%	5%	5%	100%
Question 3	5%	45%	45%		5%	100%
Question 4	30%	25%	45%			100%
Question 5	35%	45%	10%	5%	5%	100%

Table 3. Results of the system testing from the parents

Parents	5	4	3	2	1	Total
Question 1	100%					100%
Question 2	100%					100%
Question 3	100%					100%
Question 4	100%					100%
Question 5	100%					100%

Table 4. Results of the system testing from UIC Bonifacio campus students

Bonifacio Campus Students	5	4	3	2	1	Total
Question 1	95%	5%				100%
Question 2	90%	10%				100%
Question 3	85%	15%				100%
Question 4	95%	5%				100%
Question 5	90%	10%				100%

The results displayed in the tables above show the overall percentage of the system survey given by the researchers.

Table 5. Results for item number 1 in the survey

Statement: The interactive map is helpful in giving me directions of the Father Selga campus	5	4	3	2	1	Total
high school students	10%	55%	35%			100%
Bonifacio campus students	95%	5%				100%
Parents	100%					100%

Table 5 presents the results on whether the respondents find the system helpful in giving them directions of the Father Selga Campus. Based on the survey that was conducted; the high school students moderately agree that the system is helpful, Bonifacio campus students strongly agree that the system is helpful and the parents also find the system helpful in giving them directions of the Father Selga campus. This result determines that the system is helpful for the users.

Table 6. Results for item number 2 in the survey

Statement: The interactive map allows me to tour around the Father Selga Campus.	5	4	3	2	1	Total
high school students	55%	30%	5%	5%	5%	100%
Bonifacio campus students	90%	10%				100%
Parents	100%					100%

Table 6 presents the results on whether the respondents were able to tour around the Father Selga Campus. Based on the survey that was conducted, the respondents strongly agree that they are able to tour around the Father Selga campus. This result determines that the system enables the users to tour around the Father Selga campus through the use of our system.

Table 7. Results for item number 3 in the survey

Statement: The virtual tour allows me to view several offices in the Father Selga Campus	5	4	3	2	1	Total
high school students	5%	45%	45%		5%	100%
Bonifacio campus students	85%	15%				100%
Parents	100%					100%

Table 7 presents the results on whether the respondents were able to view several offices in the Father Selga Campus. Based on the survey that was conducted, the high school students moderately agree that the system allows them to view several offices in the Father Selga campus, Bonifacio campus students and parents strongly agree that they can view several offices in the Father Selga campus. This result determines that the system enables the users to view several offices in the Father Selga campus through the use of our system.

Table 8. Results for item number 4 in the survey

Statement: The virtual tour allows me to view different facilities in the Father Selga Campus	5	4	3	2	1	Total
high school students	30%	25%	45%		5%	100%
Bonifacio campus students	95%	5%				100%
Parents	100%					100%

Table 8 presents the results on whether the respondents were able to view different facilities in the Father Selga Campus. Based on the survey that was conducted, the high school students agree that the system allows them to view different facilities in the Father Selga campus, Bonifacio campus students and parents strongly agree that they can view different facilities in the Father Selga campus. This result determines that the system enables the users to view different facilities in the Father Selga campus through the use of the system.

Table 9. Results for item number 5 in the survey

Statement: The application gave me information about the environment in Father Selga Campus	5	4	3	2	1	Total
high school students	35%	45%	10%	5%	5%	100%
Bonifacio campus students	90%	10%				100%
Parents	100%					100%

Table 9 presents the results on whether the respondents were able to gain information about the environment in the Father Selga Campus. Based on the survey that was conducted, the high school students moderately agree that the system allows them to gain information about the environment in the Father Selga campus, Bonifacio campus students and parents strongly agree that they gained information about the environment in the Father Selga campus. This result determines that the system enables the users to gain information about the environment in the Father Selga campus through the use of our system.

The researchers browsed over the internet for college websites in the Philippines regarding their ways of showing their facilities and promoting their own institution using virtual tours to spread information about the amenities they offer to their students. Many of the websites the researchers searched lacked any kind of visual information of their facilities inside their campus while only few school websites provide visual information such as; photo stitching, video tour and 3D tours; whereas those school who have visual information about their facilities do not provide users interactive experience.

The researchers compared these existing virtual tours to their own research to guarantee that there is an edge within their own system. The edge is that the system guarantees a new experience for the users. The researchers also needed to make adjustments because since the

system is a web-based system, the researchers have lessened the poly counts and resolutions of the system.

The strength of the researcher's system is that there is no interactive virtual campus tour yet here in Davao city. Another strength of the system is that its availability is very easy since it is web based and user control is very easy and user friendly. The weakness of the system is that since it is web-based and it has to load assets, it needs a faster internet connection. It also needs mid-end video cards for the system to function well and to avoid lag. The quality of the system is limited because there are users that have low-end computers. There are assets that were not yet finished or implemented but the researchers answer to this issue is that since the system is online, all the researchers have to do is update it.

The present virtual information on their website only provides images to showcase their facilities and amenities to the visitors of the web page. Through the advent of technology, the researchers decided to develop an interactive virtual tour for the University of the Immaculate Conception for the purpose of improving the user's experience of visiting the campus online. The researchers then conducted system testing to our random respondents from high school students of Davao City National High School and college students from University of the Immaculate Conception, and parents of high school students.

The results of the respondent's feedback showed that they found that the application has excellent functionality. The results also show the impact of the application and acquired a very good rating from the respondents.

The results of the testing imply that the 3D Web-Based Interactive Virtual Tour of the University of the Immaculate Conception are improvements to the current virtual information used by the UIC website by providing a new experience of university virtual tour to those who will visit the school website.

The findings of the survey conducted to the high school students, Bonifacio campus students and parents answered the objectives of the study which is to provide a virtual map for the incoming first year college students, the current students from the Bonifacio campus and the parents. The output of this research which is to create A 3D Web-Based Interactive Virtual Tour is an upgrade to the existing technology the university uses for advertisement.

The results of the testing imply that by using this system on the UIC website will help in providing more information regarding their facilities and amenities they have and that they offer to incoming college students or parents who are looking for an institution for their children.

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ALERTO: A PANIC BUTTON ANDROID APPLICATION FOR EMERGENCY SITUATIONS

Czar Ian Abellana, Nikko Bonifacio, Jing Jesau Javilles, Ma Kristina Rae Manuel, Jose Ronnie Tabudlong, Eric John Emberda

ABSTRACT

Technology is broadening its scope ever so often that even people's pockets are full of it. Mobile phone is one of the modern technologies that somehow have become a necessity rather than just a plain luxury. With this, the researchers were encouraged to conduct a study that looked into developing a tool for emergency situations. Using mobile devices which most people have and guided by the Rational Unified Process model, the researchers developed an Android application which allows users to press a button when in emergency situation and needs for help. The application is capable of sending the user's current location through the use of GPS to all the enlisted emergency contact. Other features include an offline map for pointing the coordinates provided by the phone's GPS so internet access is not necessary, a reply option for the receivers to send their location to the user, and a settings tab for user modifications. At the end of the study, the application was tested for its functionality. The results of the test demonstrated that the application was indeed able to send the current location of the user. As such, it can definitely be used in emergency situations.

Keywords: *Android application, panic button, emergency situations*

INTRODUCTION

In this world today, the number of situations that can lead to an unexpected scenario is countless. There are numerous instances where a person can be in an emergency situation without the help of others. Study reveals that in 2012 the Philippines has the highest mortality rate reporting 471 natural and human-induced disasters. These disasters that occurred in the Philippines in the year 2012 killed 2,360 people and affected 2,888,358 families and 12,181,028 individuals.

In case of emergency, time matters. Within moments, your life can be in grave danger. You can be in different emergency situations. In any of these, all you need is to survive. This often happens when people are able to provide the necessary help.

Android is an open source operating system based in Linux, designed primarily for mobile devices. Study shows that Android powered devices have paved their way through the heart of the Filipinos, and climbed their way to the top of the Smartphone market. An investigation made by Comscore Inc. shows that Android has topped the market share of Smartphone subscribers with a ranking of 52% .

With this, the researchers have thought of an idea of combining common modern technology as a medium to help someone who is in emergency. The researchers came up with an idea of a Panic Button, an alerting application. Pressing a home widget button will activate the application and will send a Short Messaging Service (SMS) containing an alert message stating that the sender needs help and the coordinates of their location using the Global Positioning System (GPS) to a preset list of contacts to alert them of what is happening.

Objectives of the Study

The general objective of this study was to develop a panic button Android application that can be used during emergency situations. In addition, the researchers would want to achieve several specific objectives. First, the researchers would like to develop a panic button Android application that uses GPS and Open StreetMap Android application. Second, the researchers would like to use the application without the use of Internet data connection. Third, the researchers would like to send the coordinates of the user that indicates their current location and an alert message to the preset contact list registered in the application by pressing the alert button widget on their Android devices. Fourth, the researchers would like the receiver to automatically see the location via an offline map integrated in the application and do a quick reply which will send the coordinates of the receiver back to the sender. Lastly, the researchers would like to help people in emergency situations by creating an application that may help them in those situations.

Conceptual Framework

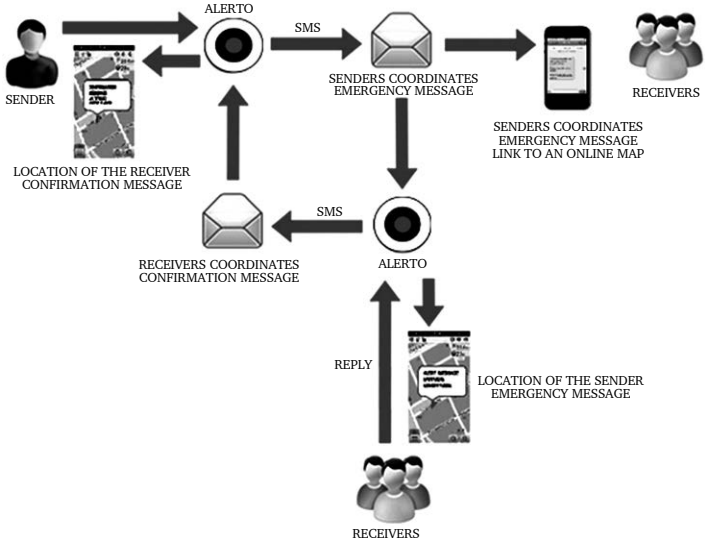

Figure 1. Conceptual Framework of the Study

Figure 1.0 shows the conceptual framework of the study. There is two points, the sender and the receiver. Both should have the Alerto application installed in their android device to be able to use the application fully. The sender, upon pressing the widget will activate Alerto to send an emergency message and the sender's current location via SMS to the preset contact list (receiver). If the receiver does not have Alerto installed, then they will only receive the alert message with the senders coordinates and a link to an online map but if the receiver has the Alerto application installed, the application will automatically open the map pointing the location of the sender along with the alert message. The receiver will then have the option to reply within the application, sending his/her location and a confirmation message to the sender for the sender to know who are the people that received his/her alert message and distinguish who are closest to him/her and to know that help is coming since just knowing help is coming is the biggest relief anyone can feel in a time of need.

METHODS AND MATERIALS

The researchers used Constructive Research Method as the research design of the study since this type of approach is based more on evaluation of the "construct" or in the researcher's case, the proposed application. This type of research method requires the proposed application to be developed with some predefined criteria. Also, the validation needed for this type of research need not be verifiable or provable by means of observation or experiment. Instead the conclusion had to be objectively argued and defined.

Figure 2. Constructive Research Method

The researchers also choose Rational Unified Process Model for the development. This process model is a well-designed process model system for responsibility allotment within a given schedule and budget. This allowed the researchers to add new updates in each release of the application with an enhancement on each new subsystem module release. The programmer released a prototype that was tested by a number of selected users and asked for the feedbacks of the users on the experience that the users had. The programmers then assessed the feedbacks, fix the errors, bugs, glitches and developed another better prototype that is better than the previous. The process from requirements to evaluation was repeated over and over until the result of the test and evaluation given by the number of users is ready to deploy.

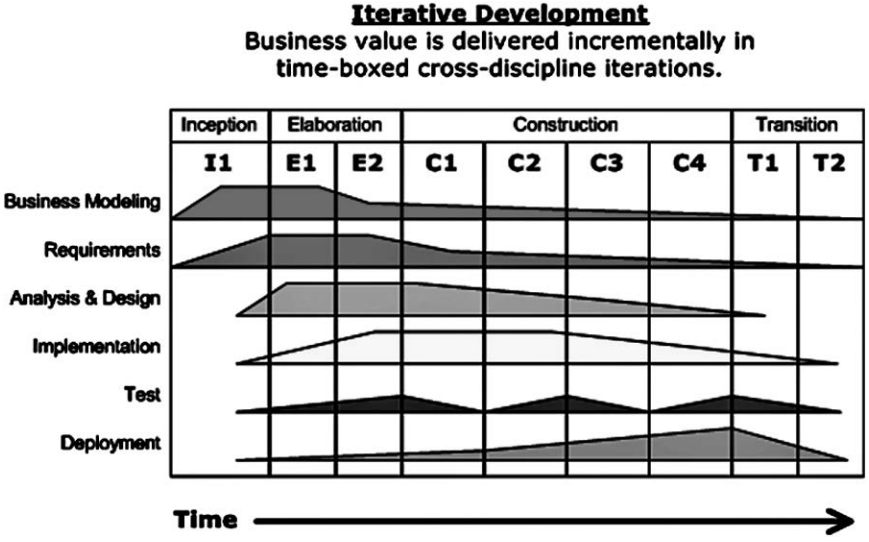

Figure 3. Rational Unified Process Model

Inception Phase

In this phase, the researchers gathered data that were needed for the proposed application. The researchers reviewed related literature and studies as to compare and contrast information and to be able to know the functionalities that should be included in the application. The researchers then identified and analyzed the data gathered from the related literature and studies and decided on the possible functionalities of the proposed application. After doing the review, the researchers have found that all of the existing applications having the same concept as the proposed application do not have an offline map.

Elaboration

In this phase, the researchers analyzed the possible functionalities of the proposed application and whether those functionalities are possible to implement. Since the researchers found that no existing application integrates offline map in the application, it was decided that the application will have an offline map as well as the basic functionalities needed in the application such as; a widget, a preset contact list, an emergency message, and a reply option with a reply message.

Construction

In this phase, the researchers started coding the application; tutorials for the java and XML programming language were used since the researchers were still learning these new programming languages that were used in the application. The design of the application was created using XML, while the functionalities were developed using java, and eclipse was the editor used. Several prototypes were created, tested, and redeveloped to modify functionalities until the final output showed that the objectives were achieved.

Transition

In this stage, the researchers tested the functionality prototype of the application. One researcher tried sending his location to another researcher and discovered some bugs, and the program was then modified. The researchers then reevaluated the functionalities of the application and created another prototype which was then tested again and when bugs were found, the application underwent another modification. This process was done several times before the researchers were able to achieve the prototype that was able to meet the objectives.

The researchers tested the application using Black Box Testing Method. The researchers used Functional Testing. It was done by using User Acceptance Training (UAT). Then, the researchers took twenty (20) android users to install the application in their mobile devices and to test the functionalities in their devices.

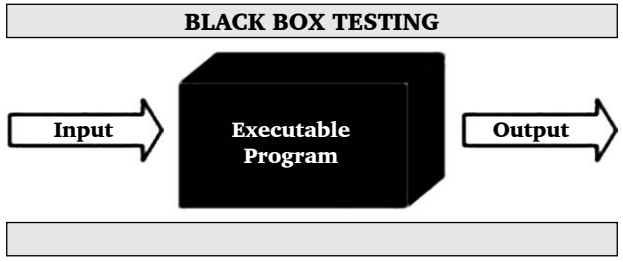

Figure 4. Black Box Testing Flow

In the black box testing procedure the input was the message sent by the sender, the executable program was handled by the Alerto application and the output was the location of the sender.

The researchers used functional testing by simulating a scenario to which the application was deemed useful. In the simulation, one researcher was in one location simulating a scene while another was in another location. Three (3) simulations were conducted in three

different locations within Davao City. In the first simulation, the sender was riding a motorcycle near Roxas Avenue. This simulation is to see if the application can be used in a moving vehicle for situations wherein the sender is in a moving vehicle and uses the application to ask for help.

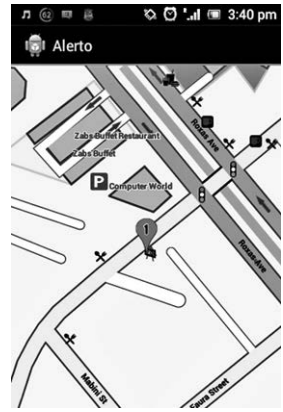

Figure 5. Simulation 1: Location of Sender as Seen by the Receiver

In the second simulation, the sender was walking towards his house in Blue Jay Street Belisario Subd., Davao City. This simulation is to see that the application can send an alert even in residential places.

Figure 6. Simulation 2: Location of Sender as Seen by the Receiver

In the third simulation, the sender was in Pelayo Street, near San Pedro Street which is within the city proper of Davao. This simulation is to see if the application can be used in crowded area where tall buildings are around.

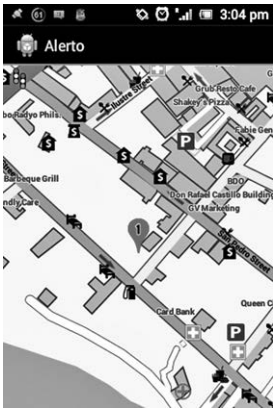

Figure 7. Simulation 3: Location of Sender as Seen by the Receiver

As seen in the screenshots above, the receiver of each simulation was able to see the location of the sender. Hence, each simulation shows that the application is indeed usable in locations used in the simulation.

A User Acceptance Test (UAT) was also conducted among 20 testers to assess the acceptability of the application.

RESULTS AND DISCUSSIONS

Table 1. Summary of UAT results

Test Cases	Android Users/ Testers that says it was Successful	Android Users/ Testers that says it Needs Improvement
Send alert message after pressing widget	20	0
Send location after pressing widget	20	0
Change how many times the widget should be clicked before it sends the alert message	20	0
Receive reply from emergency contacts	20	0
Receive the emergency message with coordinates	20	0
Send reply inside the ALERTO application	20	0
Location of the recipients who replied pop-ups via offline map	20	0
Received message and coordinates are automatically shown in offline map	20	0
Link to google maps directly opens google maps and pinpoints the sender's location (internet needed)	20	0
Pop-up link to settings if GPS is disabled	20	0
Set up emergency contact list (maximum of 4)	20	0
Edit the emergency message	20	0
Speed of application	20	0
Speed of GPS	9	11

Table 1 shows the results of the user acceptance test that the researchers conducted. Mobile devices used for the testing ranged from high-end Smartphones such as Samsung Galaxy S3 (having a quad-core processor) to low-end Smartphones such as ace mobile (having a single core processor), but since the application can cater all android powered

devices the researchers also let android powered tablets and phablets (phone and tablet in one device) users to try the application. The table shows that the testers see the application is functioning well except for the speed of the GPS which is due to the testers location. Most of those who said that the GPS speed needs improvement were inside the building (but with openings, meaning the GPS could still function), but those who tested the application while outside experienced that GPS speed was fast enough to be able to send their location to the receiver.

After conducting the testing, the researchers analyzed the results to determine if the application was really able to meet the objectives set for the study. Also, the researchers revisited all the functionalities of the application.

With the application having almost all the functionalities needed, the researchers conclude that the main objective was therefore attained. An application that can be used in emergency situations was indeed developed. Furthermore, the specific objectives of the study were also attained and are working based on the tests that were conducted. The researchers were able to develop a panic button Android application that uses GPS and Open StreetMap application, use the application without the use of internet connection, send the coordinates of the user that indicates their current location and send an alert message to the preset contact list registered in the application by pressing the alert button widget on their Android device, and enable the receiver to automatically see the location via an offline map integrated in the application and do a quick reply which will send the coordinates of the receiver back to the sender. Below are some screenshots that particularly addresses the different objectives.

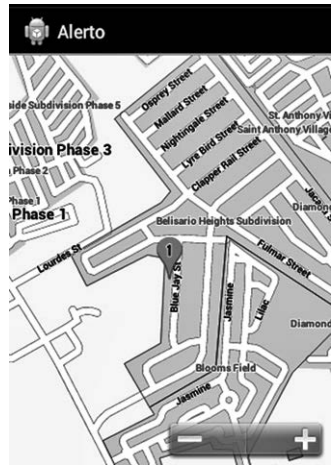

Figure 8. Location of Sender

Figure 8 shows the location of one of the researchers. The researcher was walking towards his house and this is the position received by the respondent via the Alerto application. This is what the receiver with the Alerto application installed in their devices will see upon receiving the alert message sent by the sender.

Figure 9. Receiver without Alerto installed

Figure 9 shows what the receiver without the Alerto application installed saw upon receiving the alert message sent by the sender.

Figure 10. Respondents reply to the sender

Figure 10 shows what the sender saw upon receiving the reply alert from the respondent. The marker indicates the position of the sender labeled “me” and the respondent labeled “1”. Contacts are prelisted and have their corresponding queue which will be the label for the respondent. This will enable the sender to pinpoint which respondent is nearest.

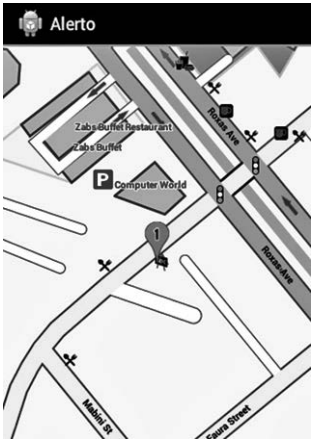

Figure 11. Location of Respondent

Figure 11 shows the location of the respondent who replied to the alert message of the sender.

After testing the functionalities of the Alerto application the researchers found that the application has additional limitations such as:

1. If the user is using an external messaging application (i.e. GoSMS, handcent), the alert message will not automatically open the offline map inside the Alerto application but instead it will just be received as an ordinary message containing the alert message, the coordinates, and a link to an online map;

2. The GPS is sometimes not accurate (majorly indoors) since it sometimes gives inaccurate positions depending upon the location of the sender;

3. The receiver must wait for the first offline map to load and be able to see the location of the sender before he/she can send a reply consisting of his/her location otherwise the application will crash.

4. The automatic pop-up of SMS alert requires internet connection and because the researchers is focused on being offline then the researchers have decided to keep the SMS alert inside the SMS application only.

5. Reboot of the device is necessary to ensure full functionality of the application. One tester had a problem loading the map in his mobile device and found out that it was functioning well after the reboot.

In conclusion, the Alerto application is a useful alternative in emergency situations where the user cannot make a call. It can successfully send the users location and an alert message thus being able to alert someone of their current situation. The Alerto application

will be beneficial to android users in the Philippines since it will give them another option in asking for help.

After taking into consideration the findings that were brought about by the testing done, the researchers recommend to the future researchers of this topic to include additional functionalities such as:

1. The use of indoor positioning system to be able to widen the scope and be able to cater users that are inside the buildings or closed infrastructure;

2. Bypass SMS fees to enable the user to send his/her location even without load balance;

3. The application is only working on android platform, future researchers could make it available to all platforms.

4. Create a server that will enable the users to see the map with the location of the sender as an alternative for viewing the sender's location.

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FEASTDIRIWANG: AN ANDROID APPLICATION FOR PROMOTING FESTIVALS

Yola Marie Morales, Beverly Quijano, Karen Joy Reformado, Anna Margarita Sienes, Kristine Mae Adlaon

ABSTRACT

To some extent, the festivals celebrated in a country represent its culture and history. In the Philippines, more than a thousand festivities are celebrated every year. However, only a few, if any at all, know about the story behind the festivals being celebrated. In an effort to increase the Filipino's and the foreigner's awareness about these festivals, the researchers developed an Android mobile application that provides information about the different festivals celebrated all over the Philippines. The researchers followed the Iterative software development model in the development of the application. It was then tested by respondents from different user groups – Department of Tourism representatives, tourists, and students. The results showed that the application is an effective tool for increasing the user's awareness about Philippine festivals.

Keywords: Philippine festivals, Philippine tourism, Android application, Iterative software process model

INTRODUCTION

The Filipino culture, just like that of any country, is one with a rich story behind it. One part of this rich culture is the different Philippine festivals that are celebrated every year to honor either a saint or a hero, or to express gratitude to a certain god for the blessings received by the celebrating tribe (or barangay, or city, or region) for the year. Many of these festivals are declared as non-working holidays in the Philippines; however, when people are off from work and students off from school for these holidays, instead of commemorating and actively participating in the events of the festival, people do other things with their time. While some Filipinos may appreciate the significance of these festivals, some Filipinos do not, as suggested by the results of the focus group discussion conducted by the researchers, where it was found that the respondents only knew two (at maximum) of the many festivals celebrated in each major island of the Philippines. Lest this lack of knowledge result in the Filipino's complete disregard for this part of the Filipino culture, the researchers came up with an Android mobile application to promote the different festivals celebrated in the Philippines.

This application helps preserve a specific part of the Philippine culture – Philippine festivals – and helps the Department of Tourism promote Philippine culture in a faster and more advanced manner. Furthermore, it helps tourists know about the festivals in their vicinity that they could participate in, thus, making them gain more knowledge about the Philippines in general.

The application is compatible with Android versions 2.3 (Gingerbread), 4.1.2 and 4.2 (both Jelly Bean) and can run in the absence of an Internet connection.

Objectives of the Study

In this study, the researchers aimed to develop an Android application that promotes Philippine festivals. Specifically, the

researchers aimed to: 1) create a History module that provides information about the history of the different Philippine festivals, 2) create a Play Game module that tests the user's knowledge about the different Philippine festivals, 3) create a Gallery module that ,and 4) create a Reminder module that can remind the user about the Philippine festival being celebrated on a certain day.

Conceptual Framework

The conceptual framework as shown in Figure 1 demonstrates how the application will help people gain information about the festivals in the Philippines. The results of the focus group discussion (FGD) conducted by the researchers showed that the respondents were not that aware of the country's festivals. With this, the application will help solve the problem. After using the application, the respondent is expected to be filled with knowledge and ideas about Philippine festivals.

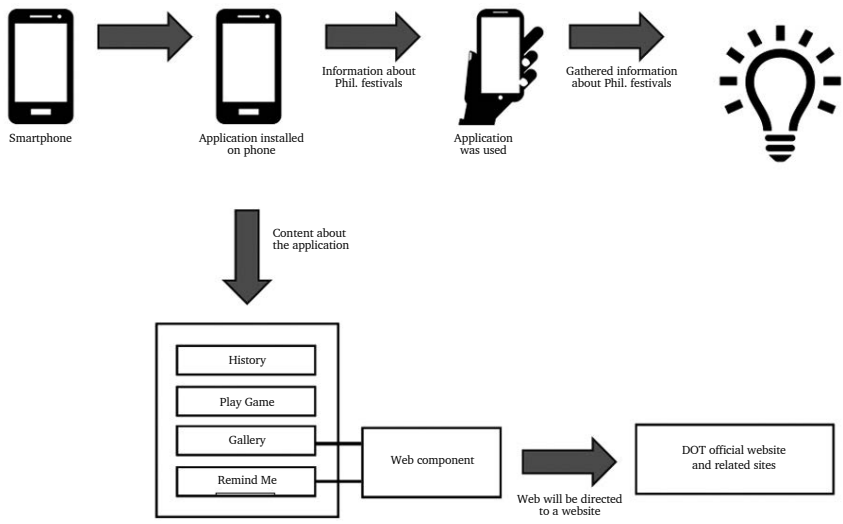

Figure 1. Conceptual Framework of the Study

METHODS AND MATERIALS

The researchers employed the following research method in the conduct of the research. The first step in this method is to identify a problem, which becomes the independent variable in the study. Following the problem identification is the software usage, where the users who will test the software are to be identified. It is assumed that software development is done by this phase. The result of the test becomes the dependent variable of the study.

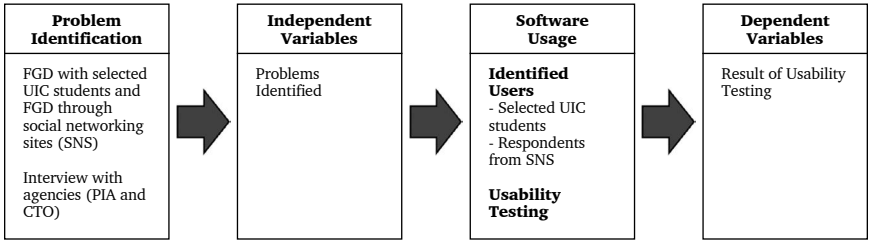

Figure 2. Research Paradigm

The first step in the research method was the problem identification. The users identified the problem to be the lack of awareness about Philippine festivals. This problem was considered as the independent variable in the study. After the problem identification, data gathering followed.

The researchers gathered data by conducting focus group discussions (FGDs) and interviews. Two FGDs were conducted, one with UIC students and another one online, through a social networking site. In the FGD for UIC students, respondents were selected from each of the eight programs: Information Technology Education (ITE), Nutrition & Dietetics/Hotel & Restaurant Management (ND/HRM), Medical Laboratory Science (MLS), Pharmacy, Engineering, Liberal Arts (LA), Accountancy & Business Administration (ABA), and Education.

The aim of the FGD was to assess the respondents' knowledge about the different Philippine festivals. The participants in the FGD were the students who usually participated in different festivals. Another method employed for the data gathering stage was the interviews. Two representatives from the Department of Tourism were interviewed, and both respondents agreed that the application could be a useful tool in providing information about the different festivals in the country and in promoting Philippine festivals.

The software development was then started. The researchers followed the Iterative Process Model in the development of the software, where software is developed through repeated cycles or iterations. This software development model was used because it allowed the software developers to take advantage of what was learned during the development of the earlier versions of the application.

After the application development, the testing process followed. The researchers followed the usability testing process in the testing phase. This tested the application through having inputs from students representing the users of the application. The researchers planned to use Performance Testing as the methodology for the usability testing.

The application was tested by Department of Tourism representatives, by tourists, and by students. The Usability Test Cases (shown in Tables 1 and 2) were used on all three tester groups to test whether the application works as expected. To further determine whether the users can actually learn something from the application, the researchers conducted a pre-test and post-test (performance measurement). Only one device was used during the testing phase – a Samsung Galaxy Young, with Android version 2.3.5 (Gingerbread).

Table 1. Module Description of the application

Test Cases	
History	This page was capable of displaying the brief history to where festivals were given birth and this was also capable of plating the Philippine National Anthem.
Play Game	This page was capable of launching the game to where the users will find significant objects to a certain festival then later on, will give additional trivia.
Gallery	This page was capable of showing photos and videos of different festivals.
Remind Me	This page was capable of displaying the calendar and the dates of the events of the festivals.
Credits	This page was capable of displaying the developers of the application. The page was for people and sources that contributed to the success of the application.
Exit	This page was capable of closing the application.

Performance measurement was done to obtain quantitative data about the test participants' (specifically the students) performance when they performed the tasks during usability test. To obtain dependable results, at least 20 user participants were needed. Performance measurement is divided into three phases: definition of goals, testing, and data analysis (to draw conclusions). Figure 3 shows the formula that was used in the performance measurement process.

Table 2. Sample Test Cases of the application

Module	Rating				
	5	4	3	2	1
History • Display the history • Playing the national anthem					
Play Game • The game will start properly					
Gallery • Displaying photos and videos about different festivals • Will be updated using web component					
Remind Me • Display the calendar • Notifying the user one week before the event • Updated using web component • Display map for plotting locations of a certain event					

PRE-TEST AND POST-TEST FOR STUDENT TESTERS

Formula:

For successful ratio	For unsuccessful ratio
No. of correct answers / Total of test cases = ration of successful iterations	No. of wrong answers / Total of test cases = ration of unsuccessful iterations

Pre-test:
Ratio of successful interactions:
781 / 1350 = 0.58
Ratio of unsuccessful interactions:
869 / 1350 = 0.42

Post-test:
Ratio of successful interactions:
1040 / 1350 = 0.78
Ratio of unsuccessful interactions:
310 / 1350 = 0.23

*1,350 = total number of test cases for pre-test and post-test for students

Figure 3. Calculation of Usability Issues

RESULTS AND DISCUSSION

The results of the tests conducted and undergone by the three user groups – the usability test for the Department of Tourism representatives and tourists, and the usability test, pre-test and post-tests for the students– are as follows.

Figure 4 represents the results of the tests done by two Department of Tourism representatives. As can be seen from the chart, the first respondent from the Department of Tourism (DOT1) gave a perfect score for all the modules of the application. On the other hand, the second user had a different evaluation. For the second user, all modules worked during testing except for the launching of the application where the user's name couldn't be registered. This part of the application was not executed properly because the application was already installed on the phone that the users used during the presentation. After the application was uninstalled and reinstalled, the username of the user was successfully registered.

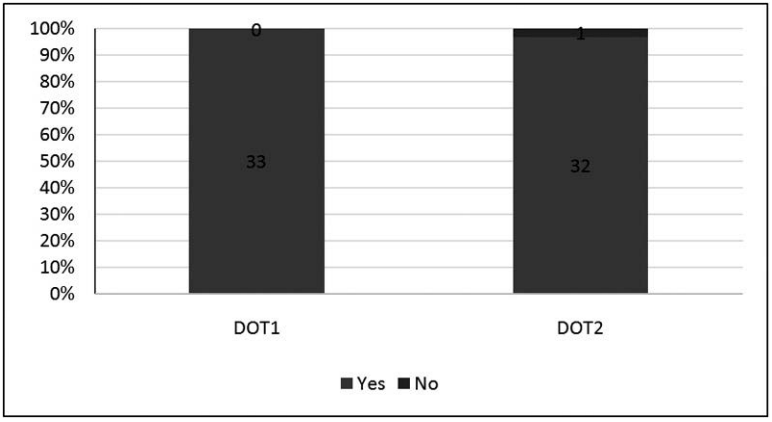

Figure 4. Comparative Result for the first and second user from the Department of Tourism

The usability test was also undergone by selected tourists (two tourists). Figure 5 shows the results of the usability test done by the tourists. Based on the results of the test, it can be seen that the application is a useful and effective tool for promoting Philippine festivals.

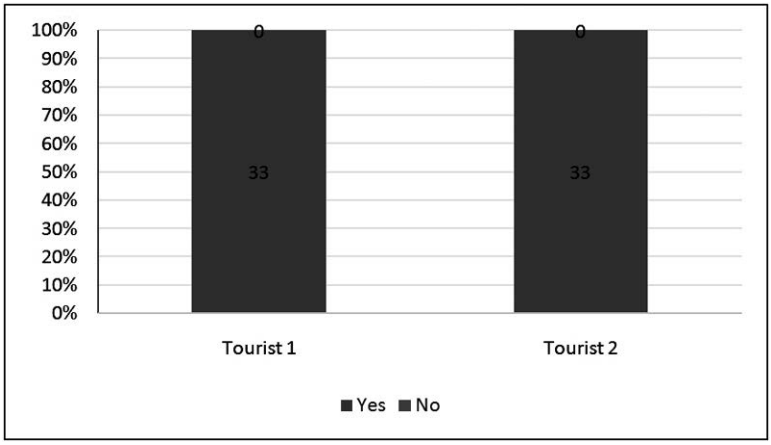

Figure 5. Graphical Representation of the Results of the Test for Tourists

The third group of testers – the students – underwent pre- and post-tests which were designed to further validate whether there is actual learning from the application after its use. Eight representatives from four programs in the University of the Immaculate Conception – the ITE, HRM, Pharmacy, and MLS programs – underwent the said two tests, the results ofwhich are shown in Figure 6.

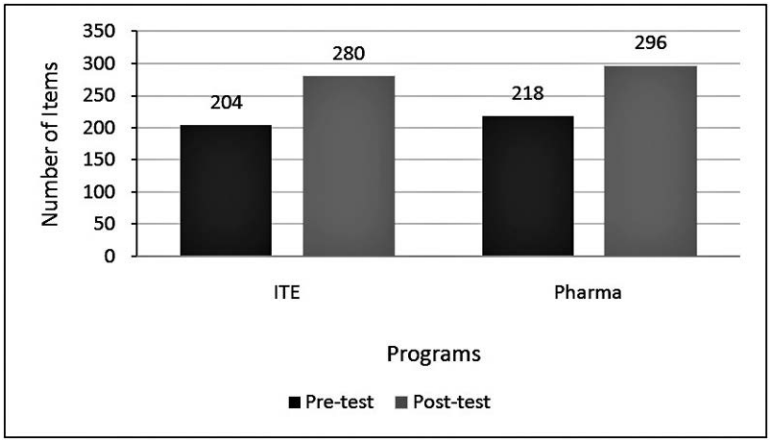

Figure 6. Result of the Pre- and Post-Test of the ITE and Pharmacy Program

As can be seen in the table above, the pretest results show that out of the 350 items, the students from the ITE program got 204 items correct (equivalent to a rate of 57%), while the students from the Pharmacy program answered 218 items correctly (61%). As is also shown in the table, the scores of the students from both programs increased in the post-test. From rates of 57% for the ITE students and 61% for the Pharmacy students, rates in the post-test increased to 78% (280 correct answers out of a perfect score of 350) and 82% (296 out of 350), respectively. The difference in the pre-test and post-test rates of the students is 21% for both the ITE students and Pharmacy students.

As for the ND/HRM, and MLS programs, the scores of the students during the pre-test and post-test are shown in Figure 7.

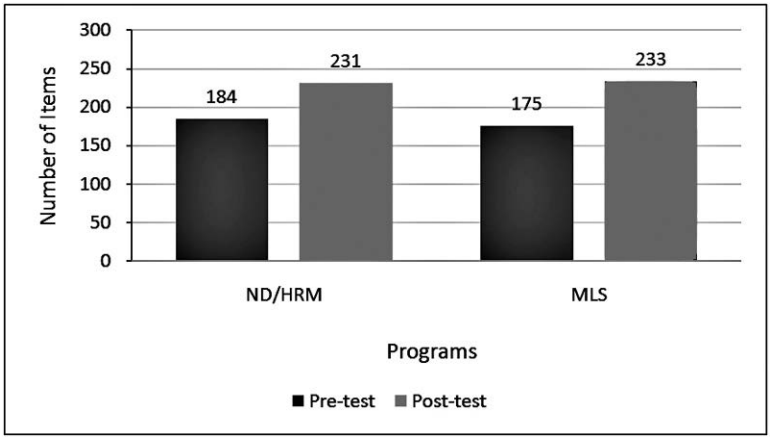

Figure 7. Result of the Pre- and Post-Test of the ND/HRM and MLS Program

Students from the ND/HRM program answered 184 out of 300 items correctly (59%), while students from the MLS program answered 175 (56%) items correctly. In the post-test, the ND/HRM students got a rate of 73% (231 items correct out of 300 items), and the MLS students, a rate of 74% (233 out of 300), showing an increase of 14% and 18% from the pre-test scores of the students from the two programs, respectively.

Based on the results shown in Figures 6 and 7, it can be seen that the application had an impact in increasing the students' scores (assumed to represent their awareness of the different Philippine festivals). Furthermore, from the data gathered and from the presentations made, the researchers formulated these implications:

- It is effective to promote Philippine festivals on Android phones (as reflected in the output from the usability test conducted to representatives of the Department of Tourism in Davao City).

- The application can give more information and awareness to the users regarding the different Philippine festivals (as can be seen in the difference between the students' pre-test and post-test scores).

- It is efficient to have a "Play Game" module in order to address more ideas through the trivia (still based on the results of the pre-test and post-test undergone by the students).

- It is likely to develop applications for promoting Philippine festivals that can also give additional information to users.

During the researchers' interactions with representatives from the Department of Tourism, the following recommendations were made:

- Real pictures should be used as background for the "Play Game" Module so that it would not appear as cartoons. Since the application is for promotion of Philippine festivals, using real pictures would to be more effective.

- The National Anthem of the Philippines should not be used as background music for the application (or for any application, for that matter). Instead, the "It's More Fun in the Philippines" soundtrack should have been used.

- Deployment of the application for large-screen gadgets should be considered so that the information and the contest of the application can be better seen and/or read.

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FINAL DESTINATION: A PUV OFFLINE NAVIGATION SYSTEM EDUCATING DAVAOENOS LOCAL AND INTERNATIONAL TOURISTS ABOUT THE DIFFERENT STRUCTURAL LANDMARKS IN DAVAO CITY

Nashra Bato-on, Leo Jestwin Lavarias, Genesis Ortiz, Raffy Tatel, Exander Barrios

ABSTRACT

Every person living in this world needs to have some time for himself. With due considerations to the kind of personalities that they possess, most of the people spend their time travelling. People often visit places they have never been to. Philippines is one of the countries in Asia that has been known for its marvellous tourist spots. This gave the researchers an idea and opportunity to study the viability of developing an Android application that will educate Davaoeños, Local and International Tourists about the Davao City's famous structural landmarks. In the conduct of the study, the researchers to identify the functionalities needed to be placed in the application. During the development, the researchers used existing technologies both for the web and Android application. Towards the end of the study, a testing was conducted. In the process, some problems on both applications were encountered. Eventually, the researchers devised and carried out solutions to solve the said problems. Some of them are carried out as recommendations to help enhance the system.

Keywords: *Travelling, Android application, web application, Davao City*

INTRODUCTION

Every person living in this world needs to have some time for himself. Depending of the kind of the persons they are, but generally, most of the people spend their leisure time in traveling, either it is inside or outside of the country. The reasons why many people choose to travel is finding new people, trying new adventures, eating different kind of cuisines and discovering new places that will truly amaze them. People travelling and staying outside of their own place for not more than a year considering their purpose is termed as a tourist (National Statistics Office, 2012), and a lot of them go to different countries especially in the Philippines.

Philippines is a country in Southeast Asia with a population of more than ninety-seven million (97,000,000) people. It is divided into three (3) Island groups: Luzon, Visayas, and Mindanao and as of March 2010, it is divided into seventeen (17) Regions. Mindanao, the second largest island holds the largest city in the entire Philippines which is the Davao City. Davao City serves as the trade, commerce, and industry hub in Mindanao (Tacio, 2013). Since most travellers are first time to visit Davao City, people need to identify places and roads for the smooth flow of travelling.

In a news article written by Cai Ordinario, the former President of the Philippine Travel Agencies Association (PTAA), Ms. Aileen Clemente stated that while extreme or adventurous activities are welcome activities in the tourism sector, they were not enough because not all tourists look for these activities. The country needs to increase cultural and heritage experiences to attract more tourists. The US tourists showed growing interest in Philippine history. She added that more schools are coming in the Philippines for educational purposes. According to the Department of Tourism, recent years have shown an increased interest in “cultural tours” set in historical places to trace the footsteps of Filipino forefathers. Former Senator Edgardo J. Angara (2011) in a Senate of the Philippine press release also stated that cultural tours marked important spots in our country’s history, and also

contributes to the movement to preserve historical and cultural sites that are slowly being destroyed due to neglect.

In an interview with Mr. Orly L. Escarilla, Acting Administrative Officer of MuseoDabawenyo, he stated that in the year 2012, a total of twenty-four thousand six hundred twenty- two (24,622) Institutional (School-Based) visitors, four thousand seven hundred forty-six (4,746) Lakbay-Aral visitors, and sixteen thousand seven hundred seventy (16,770) Walk-in tourists visited the city. Walk-in tourists are divided into three categories: local, domestic and foreign. A total of one thousand four hundred forty-one (1,441) foreign visitors, five thousand nine hundred forty-nine (5,949) domestic visitors, and nine thousand three hundred eighty (9,380)local visitors who visited MuseoDabawenyo.

All this gave the researchers the opportunity and idea to conduct a study that plans to develop an offline mobile android application that is capable of educating Davaoeños, Local and International Tourists about Davao City's famous structural landmarks.

Objectives of the Study

The study aimed to develop an offline mobile Android application that is capable of educating Davaoeños, Local and International Tourists about the different structural landmarks in Davao City. In addition, the study wished to attain some specific objectives. The researchers would like to develop an Android application that is capable of the following: a)give users (Davaoeños, Local and International Tourists) the historical backgrounds or descriptions, ratings and current pictures of the structural landmarks in Davao City, b) guide the users through textual and visual directions in an interactive map, giving locations where they could ride another jeepney or tricycle, or termed as connecting rides, c) pinpoint and describe the location of the users in the map using Global Positioning System (GPS), d) compute total fare cost (Regular, Student and Elderly Passengers) and distance from a starting point to a

specific destination, e)plot all possible jeepney and tricycle routes from a starting point to a specific destination, f) give users an approximation of travel time based on the average speed of jeepneys and tricycles, g) support instructions and directions in Filipino, English and Cebuano languages, h)sort possible routes in terms of estimated travel time, fare cost, distance, and number of rides, i) send directions in two ways: using email and short message service (SMS), and j) request updates (jeepney and tricycle routes, route descriptions, structural landmarks, and ratings) from the web application. The researchers would also like to develop a web application that is capable of the following: a) allow users to create an account and b) allow different privileges in accessing the web application (Administrator, Public and Registered Users).

Conceptual Framework

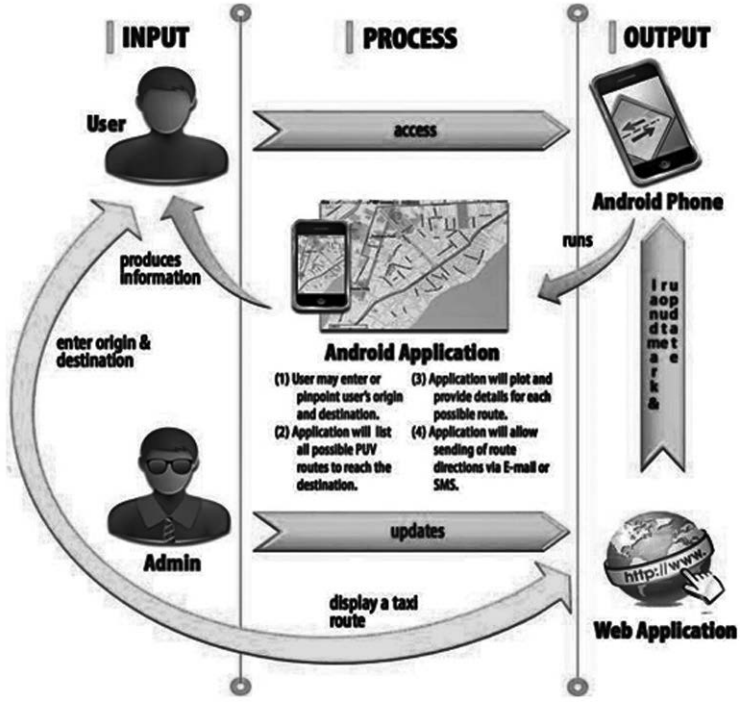

Figure 1. Conceptual Framework of the study

As shown in the diagram, the web application will automatically get data from updated web sites, and from manual inputs of the administrators. These updates will be requested and downloaded by the Android application if a network is available. The Android application will require the user to pinpoint or enter their origin and destination on the map, and then the application will create a sortable list of all possible jeepney and tricycle routes to reach the destination. Once the user selects his/her path to follow, the application will provide details for that route, such as total fare cost, estimated travel time, distance, and directions. The application will also allow sending of these details through E-mail and Short Message Service (SMS).The web application will ask the user to input origin and specific destination for taxi route and the application will output the estimated travel time, fare cost, and the possible directions, and also the Web Application will allow the user to upload structural landmarks.

METHODS AND MATERIALS

The researchers used the Rational Unified Process as the process model. Rational Unified Process model, provides risk driven approach in assigning task and responsibilities within a development organization. Rational Unified Process Model ensures the production quality of the software that meets the needs of the end user within a predictable schedule and budget.

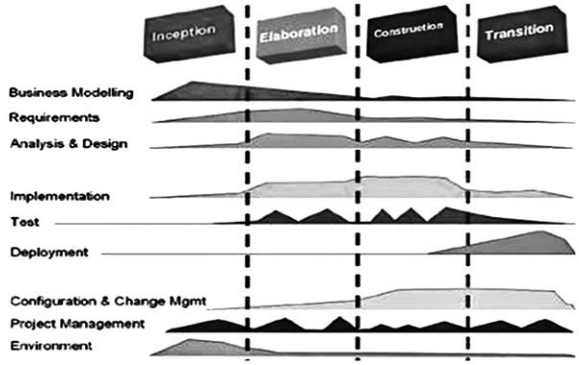

Figure 2. Rational Unified Process Model

The model also provides company a structured way in creating software programs. It provides a specific plan for every process thus, this model prevents the resources from being wasted and it also reduces unexpected development costs.

The Rational Unified Process (RUP) model has four phases: Inception, Elaboration, Construction and Transition.

Inception

In this phase, the researchers shared their ideas for the possible topics for the project. Mr. Leo Jestwin Lavarias presented to the team the idea of creating a Public Utility Vehicle (PUV) Offline Navigation System based on Android that educates Davaoeños, Local and International Tourists about the different structural landmarks in Davao City. Mr. Lavarias also presented the scope and the resources needed for the project.

Elaboration

In this phase, the researchers allocated time in discussing the process of each components, the architectural design and structure of the project. The researchers decided that the project will cover jeepney and tricycle routes. Mr. Leo Jestwin Lavarias presented the process of each component of the project. After discussing the process and the architectural design of the project, Ms. Nashra Bato-on, the Project Manager, assigned the other team members to gather data that are needed for the project such as jeepney and tricycle routes, descriptions, list of structural landmarks in Davao City, and tariff of jeepney and tricycle.

Construction

In this phase, the researchers started developing the chosen project. The team decided that Mr. Leo Jestwin Lavarias will focus in developing the android application and Mr. Genesis Ortiz will focus in developing the web Application. Mr. Lavarias also asked Ms. Nashra Bato-on and Mr. Raffy Tatel to plot the one hundred (100) jeepney and tricycle routes. After developing the project, the researchers checked the results if they attained the scope and objectives of the project. After checking, the researchers noted the errors and bugs found during testing.

During the development of the applications, the researchers used the following algorithms and technologies on the web and Android application to meet the objectives:

Android Application

1. Route map data are hand-crafted GPS Exchange Format (GPX) files, subjected to a custom C# application made by the researchers to automate optimization of files with a concept of prediction or technically bounding box, to apply:
   - Breadth-first search for jeepneys
   - Depth-first search for tricycles

2. The android application used a SAX Parser to read the GPX Exchange Format (GPX) file – a faster, more efficient, but a very limited Extensible Markup Language (XML) Parser. The researchers used a custom implementation of the technology which they call SKIM & SCAN, following a set of rules when to read a bulk data based on a preview of such set.

3. The android application used a custom implementation of OSMDroid package. The researchers extended some classes to:

- Tolerantly detect a user-dropped marker
- Read jeepney GPS Exchange Format (GPX) file in six (6) cases.
- Read tricycle GPS Exchange Format (GPX) files following a process.

4. After the preparation of route data, all routes having both endpoints as Origin and Destination or Destination and Origin, or complete routes, were displayed to the user. While partial routes, were traversed and compared point by point to other partial routes to produce double and triple rides.

Web Application

1. In web service data, the researchers used Extensible Markup Language (XML) writer to convert all the data from the database and by the use of REST controller, the researchers were able to communicate to the android application. The web application provides a function as an indicator in order for the android application to check if the data are updated or not.

2. In Draw Jeepney Routes Module, the researchers used Leaflet draw package and optimization of files with a concept of prediction or technically bounding box, to apply breadth-first search for jeepneys.

3. After an automated plotting of the route map data, the web application generates the GPS Exchange Format (GPX) file to be used by the Android application and be uploaded in the database.

Transition

In this phase, the researchers conducted User Acceptance Test

(UAT) to the public. The researchers chose random testers from the different categories (Davaoeños, Local and International tourists) to test the android and web application. There were eighteen (18) students from the University of the Immaculate Conception, and four (4) employees and six (6) visitors from Museo Dabawenyo who tested the web and android application. After the user acceptance testing, the researchers noted all the suggestions and feedbacks from the users.

The researchers used black-box testing in testing the application. In black-box testing, the tester does not examine the programming code and does not need any further knowledge of the program other than its specifications. The researchers identified the testers from the different categories (Davaoeños, Local and International Tourists). After the testing, the researchers noted all errors and record the identified functionalities not met by the system based on the testers review.

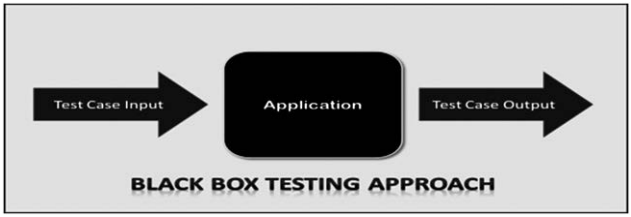

Figure 3. Black-box Testing flow

The researchers prepared the instructions on how to access the different features of the web and Android application.

The researchers explained the different functionalities of the web and Android application. When there were questions raised by the testers, the researchers answered it.

The testers rated if the said functionality has been successfully achieved and they have also written the comments and suggestions for the improvement of the project.

RESULTS AND DISCUSSION

During the development of the application, the researchers noted the following findings on the web and Android applications:

Android Application

1. The application could run on tablets (640sw) but has some drawables and text that are too small.

2. The application could get route details faster on phones with faster processors and efficient from at least 1.0 GHz.

3. The application runs faster on pre-Honeycomb versions for reasons that post- Honeycombs require more free RAM space, and the application relies more on the RAM to provide faster response time and more route suggestions.

4. The application may display all possible routes, even if a route would take a round trip before finishing destination. This may display a very long path and a very large fare cost.

5. The application's preliminary start may take a while depending on the internet connection's speed and server availability due to updates and caching.

6. The application, while searching for route details, may take a while in southbound due to a large number of possible jeepney and tricycle routes, and when there are no possible routes. However, it will give the first possible route as much as possible and is most probably the shortest and cheapest route.

7. The application could not detect connecting routes involving two (2) tricycle rides.

8. The application has a possibility not to display a landmark's

image if it does not exist in cache or there is no internet connection.

9. The application's searching speed does not majorly depend on the number of declared GPX files, but on the probability that a route exists.

Web Application

1. The JavaScript and the vivid colors of the website are not totally viewed when using Internet Explorer because it focuses in fast transmission.

2. In times of slow internet connection, the user can still access the web application. However, maps cannot be utilized properly.

3. In uploading data such as jeepney and tricycle routes, it may experience time out in the server depending on the internet speed.

4. The upload limit size should not exceed to 10MB.

To test the functionality and the acceptability of the two applications, the researchers conducted a User Acceptance Test (UAT) among different categories of testers: a.) Davaoeños, b.) Local and c.) International Tourists.

Table 1. Number of Respondents per Category

Category	Number of Respondents
Davaoeños	18
Local Tourists	8
International Tourists	2

Table 1 shows the number of respondents per category during the User Acceptance Testing. There were eighteen (18) students from the University of the Immaculate Conception, four (4) employees and six (6) from the visitors of MuseoDabawenyo who tested the web and Android application.

In the conduct of the test, the researchers devised two separate test cases, one for each application.

Android Application

1 View Structural Landmarks found in Davao City
2 View Structural Landmark's information
3 Help find directions
4 Give list of possible connecting rides
5 Show number of rides
6 Locate user's current location
7 Give total amount of fare (regular, student, elderly, disabled)
8 Plot all possible jeepney and tricycle routes from origin to specific destination
9 Compute estimated time of travel from origin to specific destination
10 Support Different Languages (English, Cebuano, Filipino)
11 Sort the information based on the estimated time of travel, fare cost, distance, and number of rides
12 Identify the structural landmark that the user pass through
13 Send directions through SMS and email
14 The application is user friendly

Web Application

1 Allow User to Log-in
2 Register Through Facebook and Twitter accounts
3 Show Current Updates
4 Show the list of jeepney routes

Jeepney and Tricycle Routes

5.1 View
5.2 Download
5.3 Sort the List in ascending or descending order
5.4 Search

Structural Landmarks

6.1 Upload a Picture
6.2 Add (ratings, description, historical background, and location)
6.3 Update
6.4 View
6.5 Add Comment
6.6 Sort the List in ascending or descending order
6.7 Search

Taxi Route

7.1 Enter the origin and destination
7.2 Provide Directions
7.3 Provide estimated time of travel

During the UAT, the researchers provided the internet connection (minimum speed of 42 Kbps and maximum speed of 1 Mbps) and four (4) kinds of mobile device with the application installed on it. The following mobile devices were used during the testing:

1. Samsung Galaxy Y (Gingerbread 2.3.5)
2. Samsung Galaxy S Duos (Ice Cream Sandwich 4.0.4)
3. Samsung Galaxy S Advance (Jellybean 4.1.2)
4. Lenovo S890 (Jellybean 4.1.3)

The researchers provided the different mobile devices for the testing because it may take time in installing the android application on their smart phones. The respondents were free to choose any of the devices provided to test all the functionalities needed. There were also respondents who requested to install the Android application on their own mobile device. Also, the respondents were free to use the web application in order to answer the test questionnaires.

The researchers conducted four (4) UATs in order to identify the development of each feature. The researchers released new prototype of the web and Android application after each test. The first and second UATs were conducted at the University of the Immaculate Conception, Bonifacio Campus, while the third and fourth UATs were conducted at the Museo Dabawenyo. In each UAT, the respondent approximately consumed twenty (20) to thirty (30) minutes to test both applications and to answer the test questionnaires.

Table 2. Summary of test results per category for Android application

	DAVAOEÑOS	LOCAL TOURISTS	INTERNATIONAL TOURISTS	DAVAOEÑOS	LOCAL TOURISTS	INTERNATIONAL TOURISTS	DAVAOEÑOS	LOCAL TOURISTS	INTERNATIONAL TOURISTS
Test Cases	YES (%)			NO (%)			MAYBE (%)		
1	100	88	100	0	0	0	0	12	0
2	94	88	50	6	0	0	0	12	50
3	100	100	100	0	0	0	0	0	0
4	100	100	100	0	0	0	0	0	0
5	89	88	100	0	0	0	11	12	0
6	88	88	50	6	0	0	6	12	50
7	88	100	100	6	0	0	6	0	0
8	89	88	100	0	0	0	11	12	0
9	100	88	50	0	0	0	0	12	50
10	94	75	50	0	0	0	6	25	50
11	94	88	100	0	0	0	6	12	0
12	100	100	100	0	0	0	0	0	0
13	94	75	100	0	0	0	6	25	0
14	94	88	100	0	0	0	6	12	0

Table 2 summarizes the test results for the Android application. It shows that the respondents from the different categories agreed that the functionalities of the application are working properly. However, there were instances wherein the respondents answered “Maybe” and “No” because of the following reasons:

- The tester did not fully understand the process of each feature.
- The testing per individual consumes twenty (20) to thirty (30) minutes.
- During testing, there are occasions that some features of the android application are slow to load.

Table 3. Summary of Test results per category for web application

	DAVAOEÑOS	LOCAL TOURISTS	INTERNATIONAL TOURISTS	DAVAOEÑOS	LOCAL TOURISTS	INTERNATIONAL TOURISTS	DAVAOEÑOS	LOCAL TOURISTS	INTERNATIONAL TOURISTS
Test Cases	YES (%)			NO (%)			MAYBE (%)		
1	100	100	100	0	0	0	0	0	0
2	83	100	50	0	0	0	17	0	50
3	94	100	100	0	0	0	6	0	0
4	100	100	100	0	0	0	0	0	0
5									
5.1	94	88	100	0	0	0	6	12	0
5.2	83	75	0	0	0	0	17	25	0
5.3	83	75	0	0	0	0	17	25	0
5.4	89	100	100	0	0	0	11	0	0
6									
6.1	89	75	50	0	0	0	11	25	50
6.2	100	100	100	0	0	0	0	0	0
6.3	89	75	50	0	0	0	11	25	50
6.4	94	100	100	0	0	0	6	0	0
6.5	100	100	100	0	0	0	0	0	0
6.6	89	88	50	0	0	0	11	12	50
6.7	94	88	100	0	0	0	6	12	0
7									
7.1	83	100	50	0	0	0	17	0	50
7.2	83	100	50	0	0	0	17	0	50
7.3	83	100	0	0	0	0	17	0	100

Table 3 summarizes the test results for the web application. It shows that the respondents from the different categories agreed that the functionalities of the application are working properly. However, it is

again to be observed that there were instances wherein the respondents answered “Maybe” and “No”.

With the intention of improving the web application, some additional features were added to cater to different privileges. The following modules and sub-modules have been added:

Towards the end of the testing, the researchers encountered some problems on the web and Android application as enlisted below:

Android Application

1. The researchers detected a problem with SKIM & SCAN algorithm. A map route may reach a very long road and costly fare. This is because the algorithm does not read the same or closely related points twice.

2. The researchers detected another problem with SKIM & SCAN algorithm. When merging two partial routes, some intersections cannot be detected, this is an effect of the solution to Problem number one (1).

3. In merging of partial routes, detection of a route with two tricycles involved will be disregarded.

Web Application

1. The researchers encountered a problem in automation of plotting route map data in the jeepney route.

2. The researchers encountered another problem in the web application in retrieving the data up to date.

3. In the browser compatibility, the researchers encountered that other JavaScript codes were not be able to load in Internet Explorer, Opera, and Safari.

To solve the problems encountered for the project implementation, the researchers devised and carried out these solutions, following the same order as the problems cited above:

Android Application

1. The researchers disregarded the breaking of the Parser if a destination or origin is found. It was continued until the end of the file instead. In effect, the retrieving of data took longer and as a solution, a setting was provided for such.

2. The researchers applied exception to the first solution as follows:
   - If origin and destination is found, read until last origin and first destination
   - If only origin is found, read until first origin
   - If only destination is found, read until last destination

3. The researchers found a solution, but in effect would add on that delay of the data retrieving. Due to the lack of time, this is considered a recommendation.

Web Application

1. The researchers used head to tail technique to connect plotted route by street names to be able to generate GPS Exchange Format (GPX) files.

2. The researchers modified every table containing the last date and time. This is to enable the android application to check if the data are already up to date.

3. The researchers were able to identify other browsers that are unable to load Java Script commands due to browser incompatibilities in compiler types.

The offline Android and the web application that educates Davaoeños, Local and International Tourists about the different structural landmarks in Davao City has undergone testing and consultations from trusted and knowledgeable project developers. The researchers provided the functional solutions considering the project's objectives for both android and web applications. The following conclusions are thereby stated for both android and web applications:

Android Application

The researchers obtained an average of 94.57% from Davaoeños, 89.57% from the Local tourists, and 85.71% from the International tourists who agreed that the researchers have successfully achieved the objectives of the project for the Android application. Therefore, the application was able to answer the objectives specified earlier since the analysis showed 89.98% was obtained that the respondents have agreed that the objectives were met in all respects. It is however to be noted that a certain percentage still doubts the capability of the application.

Web Application

The researchers obtained an average of 90.56% from Davaoeños, 92.44% from the Local tourists, and 66.72% from the International tourists who agreed that the researchers have successfully achieved the objectives of the project for the Android application. Therefore, the application was able to answer the objectives specified earlier since the analysis showed 83.22% was obtained that the respondents have agreed that the objectives were met in all respects. It is however to be noted also that a certain percentage still doubts the capability of the application.

It is worthy to note that there are some features that were not integrated into the system. The following features would help enhance the applications:

The Android application should:

1. Provide connecting rides from tricycle to jeepney to tricycle.
2. Suggest if a walking distance is possible.
3. Send a person's location to another, and able to track and notify nearest jeepney available via automated short message service (SMS).
4. Compute real-time receivables for public utility vehicle (PUV) drivers.
5. Lock a route detail for future queries.
6. Run on tablets (640sw).
7. Cater other types of connecting rides for other cities.
8. Follow location on screen through Global Positioning System (GPS).
9. View map in 3D perspective.
10. View map in real world perspective (i.e. Phone's north is Map's true north).
11. Search a place's location offline through inputs.
12. Suggest closest possible road if no route is found.
13. Provide current weather and traffic, then advice effects to jeepney population.
14. Provide choices to save cache and configured files to internal storage.
15. Provide choices to install tile maps or not, and which to install.
16. Provide the users an offline taxi route.
17. Use of mobile data to get routing results.

The web application should:

1. Provide possible routes to ride such as jeepney and tricycle routes.
2. Provide bus and van routes.
3. Draw tricycle routes.
4. Be available to other cities.
5. Cater other landmarks such as houses, small and commercial

buildings and landmarks wherein the structures are already non-existent but the place itself contains historical significance.
6. Track the nearest jeepney, tricycle, and taxi routes.
7. Provide traffic, and weather forecast.
8. Send directions via short message service (SMS) in different languages.
9. Provide a web service for routing results.

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KNOWITHERBAL: AN ANDROID-BASED HERBAL LEAF IDENTIFIER

Fatima Ledesma, Princess Lei Madriaga,
Kevin Omiple, Exander Barrios

ABSTRACT

With the high demand for medicine all over the world, the availability of herbal medicine becomes equally important. In places where people are incapable of acquiring commercially released medicines, medicinal plants are often considered the better alternative. With this, the researchers were motivated to conduct a study which aims to develop an Android-based application that helps the user recognize an herbal plant which is found only in the Philippines. This will be made possible by capturing an image of the plant's leaf using the application's camera and then analyze it through image processing. The application provides the user with the herbal plant's name, scientific name and common name, other vernacular names, properties, usage and availability. The researchers used the ORB (Oriented FAST and Rotating BRIEF) Algorithm for the processing of the image.

Keywords: Medicine, herbal medicine, Android-based application, Oriented FAST and Rotating BRIEF Algorithm

INTRODUCTION

In this era, though there are many advance modern medicines that emerge, there is a marked revival of interest with respect to medicine and traditional pharmacopoeia. Affordable and easy to access are some of the several advantages of a traditional medicinal plant (Betti et al., 2013). Like aspirin, an example of a modern medicine, is produced indirectly from medicinal plants. While studying medicinal plants, it can help understand plant's toxicity and protect human and animals from natural poisons. Also, cultivation and preservation of medicinal plants protect biological diversity; a good example is the metabolic engineering of plants (Plant Biology, n.d.).

Here in the Philippines, there are only ten (10) medicinal plants approved and recommended for use by the government's Department of Health (Penecilla, G. & Magno, C., n.d.). Filipinos oftentimes cannot buy manufactured synthetic drugs due to its high price. The passage of Republic Act No. 8423, otherwise known as "Traditional Alternative Medicine Act (TAMA)" in December 7, 1997 answers the people's present needs on health care by providing and delivering Traditional and Alternative Health Care (PAHC) products, services, and technologies that have been safe, effective, affordable and accessible for Filipinos. However, the Philippine Herbal Medicine Industry, compared with China, Japan, Korea, and Vietnam, is not yet well-developed (Jose, 2003). In addition, many people still do not know that some of the plants they have in their garden are herbal.

To widen Filipino's knowledge about herbal plants, the researchers came up with an idea to develop an Android application called "KnowItHerbal". The user will capture an image of a leaf from a plant and the application will process the image resulting to the summarization of the plant's name (scientific name, common names, and other vernacular names), properties, usage, availability, and its indication. The application identifies the image captured as herbal or not depending on its offline reference which is acquired from the online database if internet connectivity is present.

Objectives of the Study

The main objective of this study is to develop an Android application that will help the people recognize the herbal plants and also provide them with knowledge about a particular herbal plant that can be found in the Philippines. Specifically, this study wishes to attain the following: 1.) be able to recognize the herbal plants based on their leaf vein, shape and color, 2.) be able to provide the people with details about the plant, such as, the plant's name (scientific name, common names, and other vernacular names), properties, usage, availability, and its indication, and 3.) be able to provide an aid to the botanists, future botanists and researchers in their study, to the hikers in their adventure, and to the common people in their daily lives.

Conceptual Framework

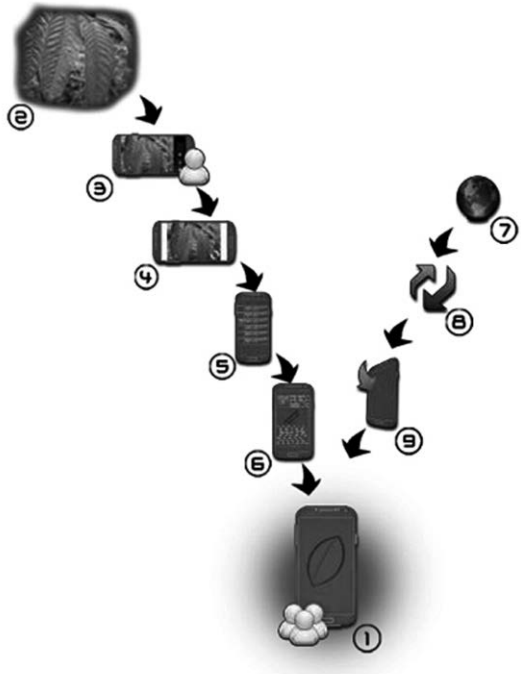

Figure 1. Conceptual Framework of the study

As shown in Figure 1, there are nine steps in using the application. The nine steps are discussed as follows: (1) "KnowItHerbal" is an application used by the botanists and future botanist, hikers, and common people for identifying (2) herbal plant's leaf (3) captured by the application using the mobile phone's camera and (4) analyze the image by using some of the algorithms in identifying the feature of the leaf. (5) After analyzing the image, the application lists the nearest and possible plant information identified during the analysis and every item in the list contains a (6) detailed information about the plant item selected on the list. (7) The application has a feature that updates its references from a web service that is used as the back end of the application. (8) The application only updates: (i) during the first installation of the application, (ii) when internet connection is available, and (iii) when the user manually initiates the update action. (9) During the application update, it downloads all the necessary files to update its references for future use.

METHODS AND MATERIALS

The researchers have used the Rational Unified Process (RUP) as their development process. The RUP is a broad process framework which involves processes tested by the industry.

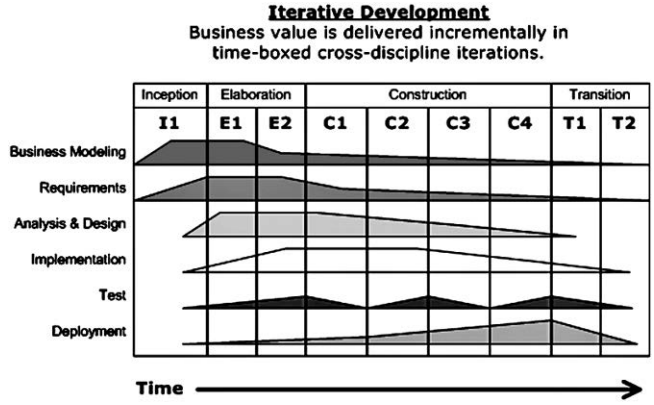

Figure 2. RUP Model

Inception Phase

The researchers gathered information about the project that would determine whether the project is feasible or not. There were reviews of related literatures or systems found online that would support the proposed research topic of the researchers. Also, in this phase, the researchers recognized the scope and delimitations of the project. OpenCV, which is one of the technologies that the researchers have used, had already been tested.

Elaboration Phase

More reviews of related literatures and systems were found. The researchers verified the scope of the project and also the delimitations. The existing systems found online were tested by the researchers in order to verify the non-existence of the proposed project.

Construction Phase

The development of the application took place in this phase. The researchers distributed the task among themselves. Some focused on improving the user interface while some focused on the actual coding. It was during this phase when all the technical preparations of the researchers were put into use.

Transition Phase

After the application had been developed, the researchers have released it to the end users for it to be tested. The researchers have implemented the black-box testing. This helped the researchers find errors in the application. As there were some, the researchers fixed them. At the end of this phase, the researchers have produced the final version of the application.

During the testing of the application, the researchers have randomly selected the respondents. The randomly selected respondents consist of common people which included people who have experienced hiking, students that were currently having a study in botany and students that were studying in line with medicine. Each respondent was asked to answer a survey form as part of the User Acceptance Testing (UAT).

RESULTS AND DISCUSSION

One of the researchers, Kevin J. Omiple, presented the concept of the capstone and then let the users test the Android application on his smart phone; particularly on the usage of the image processing module. He also oriented the users with the procedures on how to upload the data with the web service and update the Android application. Princess Lei Madriaga and Fatima Ledesma were assigned to invite random students as respondents to fill up the UAT forms. They also took note of the time duration of the test, the respondents involved on the test and their course and year.

Table 1. Number of respondents during the User Acceptance Test (UAT)

No. of Respondents	Course and Year	No. of hikers in the group
1	Civil Engineering – 4	0
2	Nursing – 4	2
2	Information Tech. - 3	1
6	ECE – 4	3
2	MLS – 1	2
2	MLS – 1 & 4	2
2	BSPharm – 3	2
2	BSPharm – 2	1
Total: 19		Total: 13

Table 1 shows how many students or professionals per course have taken the UAT. It also shows how many people already have the experience to hike. As shown in the table, 68.4% of the respondents already tried hiking.

Table 2. Tabulated response of every test case

Test Case	Yes	No	Abstain
1	13 - (68%)	6 - (32%)	0 - (0%)
2	16 - (84%)	3 - (16%)	0 - (0%)
3	19 - (100%)	0 - (0%)	0 - (0%)
4	14 - (74%)	5 - (26%)	0 - (0%)
4.1	9 - (47%)	2 - (11%)	8 - (42%)
5	18 - (95%)	0 - (0%)	1 - (5%)
6	17 - (89%)	2 - (11%)	0 - (0%)
7	17 - (89%)	1 - (5%)	1 - (5%)
8	11 - (58%)	8 - (42%)	0 - (0%)
10	17 - (89%)	2 - (11%)	0 - (0%)

Table 2 tabulates the responses of users that have tested the application to every test case.

From the data that has been tabulated from test case 1, it shows that 13 out of 19 or 68% of the respondents consider their mobile phone to be a tool to determine a plant as an herbal while 6 out of 19 which is 32% of the respondents did not consider that their mobile phone can be a tool to determine a plant as an herbal.

The researchers also found out that for test case 2 that only 3 or 16% of the respondents do not know that some plants around them are considered as herbal plant while 16 or 84% of the respondents know that there are herbal plants around them. The researchers also found out that for test case 3, 19 or 100% of the respondents finds the

application helpful.

The researchers tallied the test case 4 and found out that 5 or 26% of the respondents did not find the application accurate since 2 of them had to run the application 4 times to attain the correct result and another 3 need only to run the application once. Looking on the brighter side, 14 or 74% of them find it accurate giving a percentage rating in the range 60.0074% - 85%. The other 6 or 32% of the respondents forgot to put the percentage rating. For test case 4.1, 9 or 47% answered that the percentage result is adequate to provide them with the correct information about the plant. On the other hand, 2 or 11% of the respondents did not find the percentage result as adequate in order to provide them the correct information and 8 or 42% of them did not answer the test case.

For test case 5, the researchers found that the respondents considered the user interface of the application easy to navigate. However, 1 or 5% of them did not answer the test case.

In test case 6, the researchers found that 17 or 89% of the respondents agreed that the information provided by the application is already enough. On the other hand, the remaining 2 or 11% of the respondents are not satisfied with the information that has been given to them by the application.

For test case 7, 17 or 89% of the respondents find the information provided by the application enough for them. One or 5% of the respondents find that the information provided for them by the application is not enough while the remaining 1 or 5% of the respondents did not answer the question. There are still 14 or 74% of them have their remarks as the following:

- “Through making a medicine and to know the benefits of the plants.”
- “The origin of the herbal plant.”
- “For mobility purposes.”

- "By determining the characteristics or properties of the given object (plant)".
- "Using your mobile phone to identify most plants with their names, usage, etc."
- "I can be informed on what type of plant I am encountering in response to the signs of time."
- "When we/other people want to know a quick background of information about a certain plant."
- "In a way that researchers can identify the herbal plants easier."
- "Can easily identify plants in a short period of time."
- "If there will be new discoveries of drugs that will come from herbal plants. Less effort. Can save time and money."
- "Especially for people who are fond of researching information about plants. It helps a lot for students with their projects."
- "For research and trivial purposes."
- "Easily identify herbal plants from non – herbal plants"
- "They will analyze the plant after capturing and it will give them the accurate percentage result."

For test case 8, the researchers found out, that there are 11 or 58% of the respondents tried hiking. Also, 11 or 58% of the respondents find the application helpful when they hike. On the other hand, there are 8 or 42% of the respondents that find the application is not helpful when they hike.

For test case 10, the researchers found out that 17 or 89% of the respondents think that the application is a stepping stone for better productivity of a field research or in an everyday life. Despite the positive feedbacks, there are 2 or 11% of them did not find it as a stepping stone for better productivity of a field research or in an everyday life. The researchers also gather some comments from the 13 or 68% of the respondents. These are as follows:

- "I think the application provides all information on herbal plants that can be a

- good product in a field research or in an everyday life."
- "Can save time in identifying the plant."
- "The application can be used to preserve data about the herbal plant."
- "I can identify and become aware whether the plants in my house has its secret/undiscovered significant which can help me attain a lever of healthiness and awareness."
- "Because today people find alternative herbal."
- "Since the environment is very vast, mobility is a great way to discover something."
- "In personal information."
- "This can help us by doing our research more fruitful and easier."

Table 3. Respondent's rating for the application

Rating	1	2	3	4	5	6	7	8	9	10
No. of testers rated	0	0	0	0	2	1	5	5	5	1

Table 4. Respondent's interest toward mobile innovation

Rating	1	2	3	4	5	6	7	8	9	10
No. of testers rated	0	0	0	0	0	2	3	6	7	1

In recognizing the leaf's vein and shape, the ORB algorithm was used. In processing the image, the application feeds two images to the algorithm and then first changes the color of the images into gray. Next, the algorithm then detects the features of the two images. After that, the algorithm extracts the features of the images and stores it in a variable for further processing. Lastly, the algorithm then matches the features being extracted from the images and uses its key points in computing the good matches in the images.

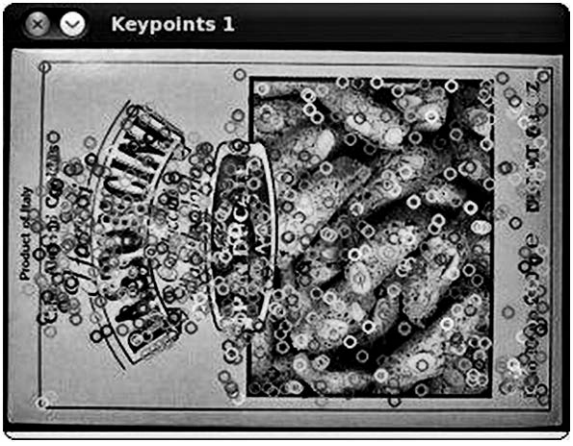

Figure 3. A possible scene of feature detector and descriptor extractor

In processing the scene image versus the object image, FAST and its variants are the method of choice for finding key points in real-time systems that match visual features. It is efficient and finds reasonable corner key points, in which the algorithm only considers the shape that have been extracted during the feature detection. During the shape detection, the Feature Detector traces the shape of the scene image and thus, the Feature Extractor now then extracts the key points of the scene image.

Figure 4. Example of Feature Detector that shows only the shape of a source image

Although, it must be augmented with pyramid schemes for scale, and in our case, a Harris corner filter to reject edges and provide a reasonable score. Many key point detectors include an orientation operator (SIFT and SURF are two prominent examples), but FAST does not. There are various ways to describe the orientation of a key point; many of these involve histograms of gradient computations like in SIFT and the approximation by block patterns in SURF. During the feature matching process of the algorithm, the ORB uses Brute-Force Hamming in which the matcher takes the descriptor of one feature in first set and is matched with all other features in second set using some distance calculation (Jagtap R. & Sadalage J., n.d.). The closest one is returned.

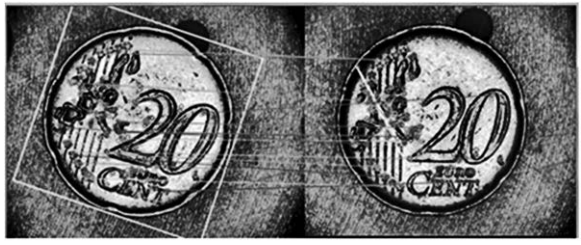

Figure 5. Using Brute-Force hamming in matching the key points generated by the Feature Detector

In providing the plant's name, scientific name, common names, other vernacular names, properties, usage, availability, the researchers referred to a website that provides information of every herbal plant and it is community based. In record, the researchers have acquired 780 herbal plants information. Some of the information gathered from the website were lacking due to the on- progress research of the plant.

During the testing done by the researchers among the respondents, results were fair enough to give insights to the researchers about the study being conducted. Some of the respondent's responses were in a sense of negation to the study being conducted and these negations can be further explained and considered with the given factors discussed in the succeeding sections.

For test case 1 of the testing, 6 or 32% respondents do not consider their mobile phone as a tool to determine a herbal plant. With the respondents reply to the question, they might think that their phones can be good enough only for entertainment and communication but not for doing an analysis of an herbal plant's leaf to determine if it is an herbal plant. For discussion, mobile phones nowadays pack good features that interest the people. One of these features is the ease of communication such as messaging and the availability of social network applications that enables the user to communicate more. Another good feature of mobile phones nowadays is its ability to deliver entertainment and tools for productivity to the user because of its embedded graphic processors, enhanced audio quality and high-powered processors that could do multitasking. Such features can be used for new innovations in the future but for delicate researches and analysis, mobile phones are not yet considered as a primary tool in this field because there are dedicated tools for doing such researches and can deliver very good results. This interprets the responses of the 6 respondents to the query in which if they can consider their mobile phones a tool to determine an herbal plant. But the 13 or 68% remaining respondents believe that the study being conducted can be a stepping stone for the usage of mobile phones as a tool in field research specifically in identifying an herbal plant.

In test case 2, majority of the respondents are knowledgeable enough that some of the plants around them are herbal plants. The result of this test case shows that people are well aware that some of the plants around them are herbal plant and can be used as an alternative medication to a specific illness.

Test case 3 shows that all of the respondents consider "knowITherbal" helpful as a tool to determine an herbal plant.

The accuracy of the result delivered by the application in test case 4 varies with the environment where the plant's image was taken. Some of the tests were conducted in a low light condition and one factor for having good result is having good light ambience during the capture of the image. The conducted test use only the availability of the mobile phone's LED flash which gives an alternative light to enhance the ambience of the image during low light conditions. By this alternative, the natural color of the subject plant may be overexposed because of the uncontrolled light produced by the LED flash of the mobile phone.

Overexposure of the image to light may affect the processing of the algorithm used in the application because study itself does not have correcting function for image's overexposure.

Another factor for having better results is to implement controlled environment. Controlled environment includes the approximate 1 foot distance of the camera to the subject leaf and having a well-lit environment.

Distance and Background

To get better result in identifying the captured image, the algorithm has to recognize the entire form of the plant so that it can process the entire image and determine its features. These features include plants shape and veins. For the algorithm to work properly and can identify the plants features, the plant's leaf must be subjected to a plain background image so that the processing will be focused to the plants key points.

Well-Lit Environment

For a well-detailed image, the captured image has to be detailed very well and the contribution of well- lit environment is a factor to achieve this image quality. Good ambient light in the surrounding can help the camera to produce good image detail.

Test case 5 speaks that 18 or 95% of the users consider their experience in the application's interface easy to navigate and only 1 or 5% of the users abstained to this test case maybe because he/she cannot determine if the interface of the application is easy to navigate or he/she found it hard or having difficulties in navigating the application.

In the researcher's perspective, sometimes, someone can have difficulties in navigating the application because they encounter new custom navigation interface of the application that they are not familiar with. One of these new custom navigation interface implemented in this application is the sliding menu. Sliding menu that is composed of various menus (Camera, Plant List, The Application and Open Source Licenses) is accessible by tapping the upper right button in the action bar of the application or by sliding from the left edge of screen to the right to drag the sliding menu and make it visible.

Figure 6. Main menu of the application

Accessing also the toggle view button for changing the view of the list as vertical or grid list is located at the upper right of the action bar which is only available when the user is in the Plant List page of the application. The main difference of the two views is, the vertical list view shows the plant's image thumbnail, name and its first three listed scientific names of the plant entry while the grid list view focuses on the plant's image and its image thumbnail.

For test case 6, some of the respondents that have tested the application are studying course that is in line with medicine. The respondents find the information in the application so basic that an ordinary people only need, but if the user is in the field of medicine especially in botany, they want to know in what kingdom does the plant belong and the scientific names varies in every kind of specie of a particular plant. This information that are ought to add would be more informative and helpful. The commentaries are given to the researchers by students that are taking up courses that are in line with the study of medicine and having their thesis. The application would be more helpful if the information lacking is included in the application so that the students can progress to their study easily and efficiently.

The researchers have discussed to the respondents that the requested information can be done if the researchers have more ample time to research more about all the plant entries. Another reason is that the source information being used by the researchers during acquiring the information of every plant do not provide much more informative data but given the source site's disclaimer, "The compilation on medicinal plants is part of the overview on Philippine alternative medicine and intended for general information, educational use and springboard material for further studies."

Test case 7 queried the respondents if the application, can be a tool for field research with regards to the study of herbal plants. Majority of the respondents answered that the application can be a tool for field research. But some of the respondents answered "NO". The respondent that responded "NO" is assumed to be thinking that the application

cannot give a valid result because of its limitation.

Test case 8 queried the users if they have experienced hiking. More than half of the respondents, 11 or 58%, affirmed that they have tried hiking while 8 or 42% have not gone hiking.

Test case 9 shows that majority of the respondents' rating to the application are fairly high, ranging at a rate of 5 to 10. Two respondents rated 5, 1 respondent rated 6, 5 respondents rated 7, 5 respondents rated 8, 5 respondents rated 9 and 1 respondent rated 10. Significantly, ratings from 7 to 9 suggest that the respondents' interest to the application is fairly high.

The respondents were asked if they consider the application, a stepping stone for better productivity of a field research or in an everyday life. In test case 10, 17 or 89% respondents responded that the application is an entry to new approach of use in the mobile technology and a stepping stone for a better productivity of the respondents and who can benefit this application.

In test case 11, 7 or 36.84% of the respondents with a rating of 9 out 10 have the highest count of interest in this mobile innovation. Overall, all of the respondents rated the application higher than 5 out of 10. This shows that the respondents appreciate this innovation because they saw that the Smartphones can be a possible tool to help every individual and a help to the studies of the students.

In the development, the researchers used particular utilities to develop both the Android application and the web service. Particular procedures are observed in the development.

Android Development

In building the Android application, the group's programmer used Eclipse Android Developer Tools (Eclipse ADT) for the development. The first approach taken by the group in developing the application was to plan for the user interface so that building the UI will be straight forward. A good UI have to be easy to render by the Android operating system and easy to navigate so that the interaction of the user and the user experience will be smooth. This will also avoid drag time in navigating the application.

After designing the UI of the application, the main components such as the algorithm, the plant listing, and camera feature were first addressed because these are the core of the application. Before running the application, it is imperative to have the camera working so that real-time images will be fed to the algorithm. After working with the camera, implementation of the algorithm was next. The algorithm has to run in background so that the UX will be maintained. Enhancing the performance of the algorithm has to be done so that the application can give sufficient result to the user. Next is establishing the plant entries. In this module, the algorithm can refer to many images for comparison. The plant entries have a listing in the application that also servers as an herbal plant dictionary.

After implementing the core modules of the application, the application utilities followed. These utilities include the update module, Open Source Licenses citation module of the application and other utilities of the application. Lastly, the polishing of the application followed in which the programmer of the application did some debugging and fixing.

Web Service Development

The first step in building the web service was coding the Create, Read, Update and Delete (CRUD) functions of the application. These

included the images, plants, publish and users module in which share the common structure of CRUD throughout the service. Next was implementing parsing of the XML file for the plant data entries that will be stored to the database of the service. The application accepts only XML (.xml) files for parsing. Next was implementing the multiple upload of the images. In this way, the user of the web service can upload multiple images at the same time. Next was the implementation of the JSON for the data exchange to the android application. The JSON passes custom formatted XML file that will be parsed by the application and be presented to the plant entry detail. Lastly was the polishing of the user interface of the service so that the user can easily navigate the web service interface.

During the development of the Android application, a constraint to the use of large images in Android API level 10 (Gingerbread) was identified. Almost all of the mobile phones that are running Android API level 10 have low amount of RAM that cannot handle large allocation of large images when feeding it to the algorithm. Another finding of the researchers is, the population of users with android mobile phone with the version of API level 16 are now recorded much higher than 4 years ago and the hardware features of these mobile phones are now high enough to handle large allocation of large images and can perform faster operation on running algorithm.

Version	Codename	API	Distribution
1.5	Cupcake	3	0.1%
1.6	Donut	4	0.3%
2.1	Eclair	7	3.1%
2.2	Froyo	8	12%
2.3 - 2.3.2	Gingerbread	9	0.3%
2.3.3 - 2.3.7		10	53.9%
3.1	Honeycomb	12	0.4%
3.2		13	1.4%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	25.8%
4.1	Jelly Bean	16	2.7%

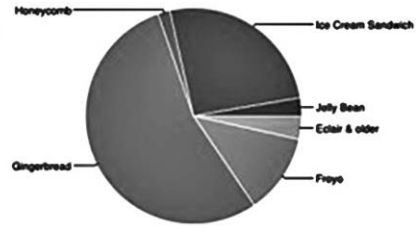

Figure 7. Google Android API Distribution as of December 2010

Version	Codename	API	Distribution
2.2	Froyo	8	1.3%
2.3.3 - 2.3.7	Gingerbread	10	20.0%
3.2	Honeycomb	13	0.1%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	16.1%
4.1.x	Jelly Bean	16	35.5%
4.2.x		17	16.3%
4.3		18	8.9%
4.4	KitKat	19	1.8%

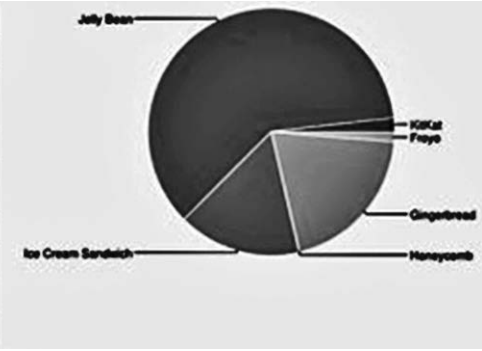

Figure 8. Google Android API Distribution as of February 2014

In the course of the development and testing of the application, both the respondents and the developers saw some flaws in the application. Hence, both have suggested that improvements be made.

The suggestions of users were as follows:

- The application has to be more accurate.
- Can be submitted to online server to be processed thoroughly.
- More available information about the plant (e.g. plant's genus, species of origin, how to process the plant's leaf, etc.)
- The compatibility of the application in lower API
- Covering more level of Android OS.

The suggestions of the developers are as follows:

- The algorithm have to be implemented in Native Language (Objective C / C++) because the processing of the algorithm implemented in Native Language is comparably faster than implementing the algorithm in Java programming language.
- In the application, it is recommended that it uses an optimized image so that the presentation of the images in the application

is better and the loss of information in the image will be avoided.

- In the Back-End, a custom image cropping plugin have to be used before uploading the image so
- that the image of a particular plant is focused on the leaf and can eliminated the excessive detail of the image since the algorithm that applied in the application don't have the process in eliminating the excess information of the image.
- The information have to be more detailed so that the students, especially studying in the field of medicine and botany, can refer easily on the application without requiring them to research further.

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MOBILE BASED CIGARETTE SMOKING INCIDENTS SURVEILLANCE WITH MAPPING SYSTEM

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Charles Anthony Soho, Melecio Torralba,
Kristine Mae Adlaon

ABSTRACT

Cigarette smokers have increased dramatically in Davao City over the past several years. The Government is aware of the rising rate of smokers so the new Anti-Smoking Ordinance in Davao City was made to minimize the problem. The study aimed to determine the areas in Davao City where smoke belchers usually smoke using GIS and Android application. The researchers gathered data from public document for relevant reports in the Department of Health and in the Davao City Police Office. Through using the system, the researchers were able to pinpoint and mark the area in the map after sending in the online server. The researchers successfully developed an android mobile application, develop a web application with mapping system, automatically generate statistical counts of cigarette smoking incidents and were able to locate the areas in Davao City with a high rate of smokers. In conclusion, the applications were able to help the citizen's awareness about the Ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance, in knowing the cause and effects of smoking and places in the city where there are many smokers through the use of the android application and through the Web Application the target user (DCPO) were able to receive smoking incidents and map it out.

Keywords: *Android Phones, Camera, Cigarette Smoke, GIS, GPS, Image Processing, Map, Marker, Software Application Web-Based application, Surveillance, Cigarette Smoking incidents, Mobile Based Application, Black-box Testing.*

INTRODUCTION

Smoking cigarette is one of the most common vices that create a huge impact to the society. According to the WHO (World Health Organization), the Philippines is considered as one of the countries with the highest number of cigarette smokers in Southeast Asia. In addition, there are 87,600 Filipinos who died of smoking related cases and diseases (May 2011) and 27.3 percent (27.3%) are youth ages 13 to 15 and 28 percent (28%) are 15 years and older (Global Adult Tobacco Survey, 2009). Because of this issue, the city government of Davao strengthens the anti-smoking campaign and furnished and implemented the Ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance which is no smoking in public places.

The new comprehensive anti-smoking ordinance was enacted in Davao City last September 9, 2012 and enforced on May 31, 2013. According to the data given by the DCPO (Davao City Police Office), as of June 2013, it is observed that there is a significant increase in the apprehended smokers partly due to the lack of proper dissemination about the ordinance. On the next month, a significant dropped of the numbers of captured cigarette smokers was observed. This is credited to the improved explanation of the enforcement of the ordinance or the strict enforcement has lessened. With this problem, the researchers came up with an idea of establishing a surveillance to monitor cigarette smoking incidents in Davao City through an image recognition application in desktop application and the use of Android smart phone and web-based mapping survey.

The researchers integrated applications of mapping system, image processing, and Android smart phones to create an applications to push through this research. Through this research, the researchers aim to promote vigilance and strengthen the implementation of the ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance and encourage Dabaweño's health awareness regarding cigarette smoking.

Objectives of the Study

The general objective of the researchers is to develop a Mobile-based Cigarette Smoking Incident Surveillance with Mapping System. In line with this general objective, the researchers also identified a number of specific objectives. First, they aim to help the New Comprehensive Anti-smoking Ordinance and to promote public health awareness in smoking related cases and diseases in Davao City. Second, they aim to create an Android application that promotes vigilance to implement the Ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance. Third, they aim to develop a desktop application that recognizes cigarette butt or cigarette in the capture images. Fourth, the researchers aim to develop a web application with Mapping System that monitors and locates cigarette smoking incidents. In addition, they aim to develop an Android application that locates the concurrent location through GPS (Global Positioning System) of the captured image of a cigarette butt or cigarette that offended the Ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance. Lastly, they aim to develop a web application that automatically generates statistical count of recognized cigarette butt or cigarette in public places for DCPO's and DOH's perusal.

Conceptual Framework

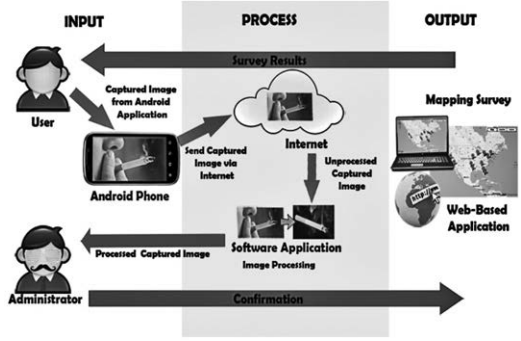

Figure 1. Mobile Based Cigarette Smoking Incidents Mapping System

Figure 1 shows how the cigarette butt or cigarette is recognized through desktop application from the captured image and tracked the location by the GPS (Global Positioning System) by Android application and a mapping survey with the use of web application. As the user access the Android application using an android phone, the user captures an image of a cigarette or cigarette butt in a public place. Next, the image and the details such as the time and date, the location from the GPS and the comment of the user are sent through the internet and passed to a web server where the unprocessed image is placed for cigarette recognition. After the image is processed, it is labeled as processed image. In the event that the processing of image unsuccessfully recognizes, it will be manually intervened by the administrator which is the Davao City Police Officers. They will recheck the unprocessed image before enlisting it to the web mapping survey application. After the image processing recognition, the location is tagged to the processed image. With location from the processed image, the location is marked down on the map.

METHODS AND MATERIALS

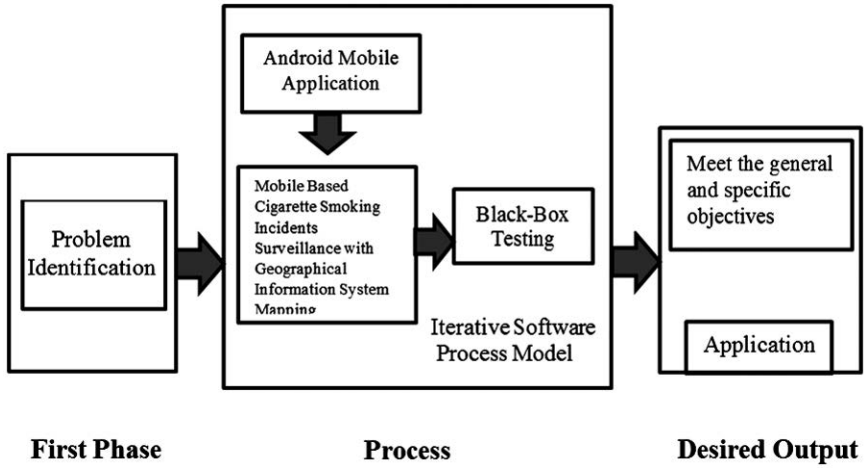

Figure 2. The Diagram for the Input Process Output Research Method

Figure 2 indicates the research method used by the researchers. In First Phase, the researchers identified problems by the gathered data and researched topics and problems, such as the current situation in the society, particularly, in line of health and education involving cigarette smoking related cases and diseases. After the problem was identified, in the process stage, the researchers generated the necessity of the problem that carried out in the developed system "Mobile Based Cigarette Smoking Incidents Surveillance with Mapping System" that may solve the current problem of the society. In developing an application, the researchers used an Iterative Software Process Model comprised of different phases. Next, a black box test (functionality test) was performed with UAT (User Acceptance Test) to the target clientele of the application. Lastly, the desired output of the researchers was piloted with which the usability and effectiveness of the project, user satisfaction were ensured and accomplishment of objectives was assessed.

The researchers had chosen the Iterative Model for system's project methodology and for software development. This model consists of different phases: Requirements, Analysis and Design, Implementation Testing; and, Evaluation. With this model, less time is spend on documenting and more time is given in designing, building and improving the project step by step with which defects are tracked at early stages and the downward flow of the defects is avoided.

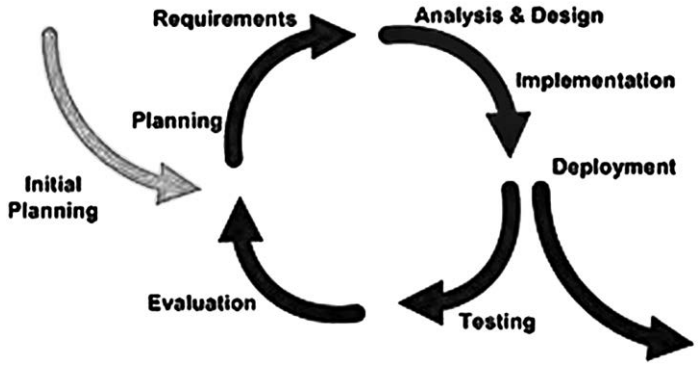

Figure 3. The Diagram for the Iterative Design Model

Requirement

In this phase, the researchers gathered ideas of the identified problems in conceptualizing the project looking into smoking related cases. The researchers administered interviews, researched about the tool they used in developing the project; android smart phones, web and desktop application. The tasks were distributed to the team according to their capability and the project schedule that followed throughout the development of the project was set. The researchers gathered data from different government agencies that has been identified to be of help in terms of acquiring relevant information such as: (1) Department of Health, (2) Davao City Police Office and (3) City Government Office.

Analysis and Design

In this phase, the researchers came up with a final analysis and decision of the feasibility of the system. Also, with reference to the data gathered on the previous stage, the researchers started to come up with final evaluation on what technologies to use in order to materialized the system. After thorough evaluation, the researchers identified the following different programming languages: Java, PHP, and C#.

Implementation

After analyzing and classifying the requirements, the researchers started to design and construct a prototype of the project. In this stage, the researchers implemented the design, coded, integrated and implemented the project. The tools required are being integrated. In the implementation of the project the system undergo series of testing within the researchers before tested to the different people.

Testing

After it is coded, integrated and partially tested, the researchers tested the system and identified the usability and issues that arise in the user interface specifically for the people who benefits from this study. In this stage, Black Box Testing was used. It is a testing technique that overlooks internal mechanism of the system and focuses on the output generated against any input and execution of the system. With this testing method, the testers are not required to know coding or internal structure of the software. The tester checked the objectives and the features to be performed. After the input stage, the tester processed and performed functions of the application Mobile Based Cigarette Smoking Incidents Surveillance with Geographical Information System Mapping based on the objectives of the research. The last stage is the output of the test to show the usability and efficiency of the application whether it has met the general and specific objectives or not.

Evaluation

In this phase, the software is evaluated through the result of test. The project is tested with an Android smart phone application and the web-based system is also tested by the Davao City Police Officers. From the evaluation, the requirements were reviewed, and changes and additions to requirements were proposed.

RESULTS AND DISCUSSIONS

Table 1. Number of Respondents

Respondents	Number
Davao City Police Officers (DCPO)	3
Department of Health (DOH)	2
Employers	7
Students	23

Table 1 shows the total number of chosen respondents during the UAT (User Acceptance Test) There were three (3) from the DCPO (Davao City Police Officers), two (2) from DOH (Department of Health of Davao) and seven (7) are employees, six (6) of them are IT Staff, Graphic Artist, Sales Supervisor, Marketing Supervisor and ECM Staff from RDL and one (1) is RN/Nurse from (UIC) University of Immaculate Conception as the tester for Administrator side of the web application. For user's side, there were twenty-three (23) respondents, twenty-two (22) of them were from (UIC) University of Immaculate Conception and one (1) from the Ateneo De Davao.

During the testing, the researchers provided the equipments such as; Mobile, Laptop and Internet to undergo an actual process of the system functionality provided in the user acceptance test. The Internet connection, in the course of the testing was in about 500Kb (Kilobytes) up to 1Mb (Megabytes). The Android application was installed in two (2) mobile phones one; is LG L7 with an Ice Cream Sandwich 4.0.4 version of operating system and Samsung Galaxy Young, with Gingerbread 2.3.5 version. The laptop that was used by the researcher is an HP with the following specifications:

- Operating System: Widows 7 Ultimate-32 bit
- Memory: 2096MB RAM
- Processor: Dual Core

The user acceptance test was divided into three (3) categories, one for each of the web application, Android application and desktop application. The web application and Android Application was answered with the mode of users and the desktop application was answered by administrator. The test conducted from the different set of users and respondents are shown in the following figures:

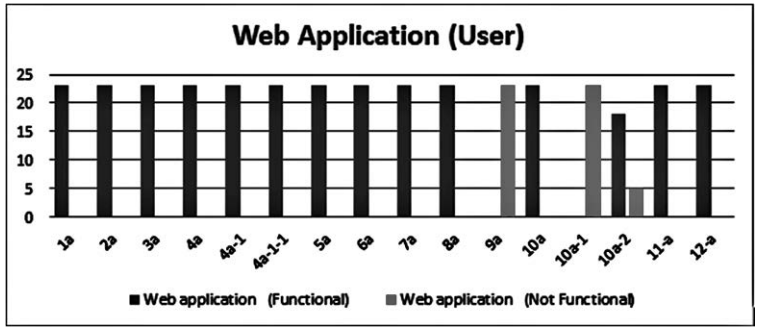

Figure 4. Test Case for Web Application (User)

Figure 4 shows the testing results for the 12 test cases tested by twenty-three (23) user-mode respondents. In 4a and 10a, the test cases have two sub-test cases. The researchers observed that in most of the test cases, the application was functioning well. Test case 10a which is the manual intervention of the system has two parts which is 10a-1 if the image has cigarette but not recognize and 10a-2 if the image has no cigarette generating a result of zero (0) and twenty-three 23 for test case 10a-1, 18 and 5 for test case 10a-2 with a corresponding answer of yes and no respectively.

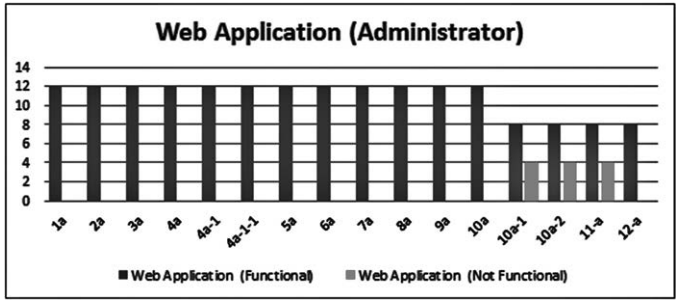

Figure 5. Results of the Test Case for Web Application Administrator)

Figure 5 shows the testing results for the 12 test cases tested by twelve (12) administrator respondents. In 4a and 10a, the test cases have two sub-test cases. The researchers observed that most of the test cases was functioning well and has discovered the result in test case 10a which is the manual intervention of the system has two parts which is 10a-1 if the image has cigarette but not recognize and 10a-2 if the image has no cigarette creating a result of eight (8) and four (4) for test case 10a-1 and test case 10a-2 with a corresponding answer of yes and no respectively. In test case 11-a test has some minor bugs when the respondents try to log-out their accounts and come-up with a result of 8 and 4 with corresponding answer of yes and no respectively.

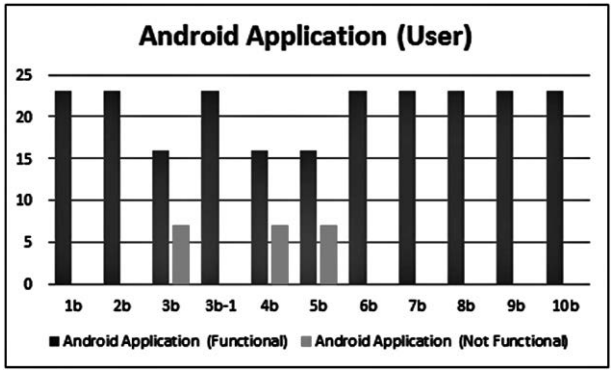

Figure 6. Results of the Test Case for Android Application (User)

Figure 6 shows the testing results for the ten (10) test cases tested by twenty-three (23) user respondents and 3b has one sub-test cases. The researchers observed that most of the test cases was functioning well except for 3b, 4b and 5b. In test case 3b which has a sub-case of 3b-1 which is a precondition of test 1b has some minor bugs in dealing with GPS and Internet. In 4b test case the results is similar to 3b because 4b test case is a precondition of 3b-1 which is a sub case of 3b. During testing Internet connection was a little bit slow and the researchers observed that in test case 5b has some bugs in sending images.

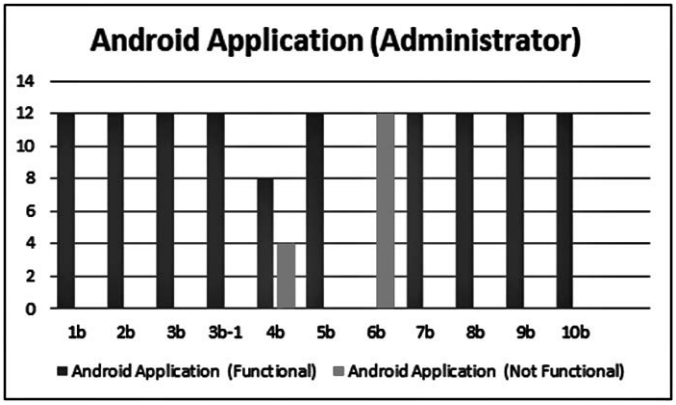

Figure 7. Results of the Test Case for Android Application (Administrator)

Figure 7 shows the testing results for the ten (10) test cases tested by twelve (12) administrator respondents and 3b has one sub-test cases. The researchers observed that most of the test cases was functioning well except for 4b and 6b. In test case 4b in capturing image has flaws on searching and displaying the latitude and longitude due to low speed of Internet connection. Also in test case 6b is a precondition if the mobile phone has no Internet connection during the testing all mobile phones that were tested has Internet connection.

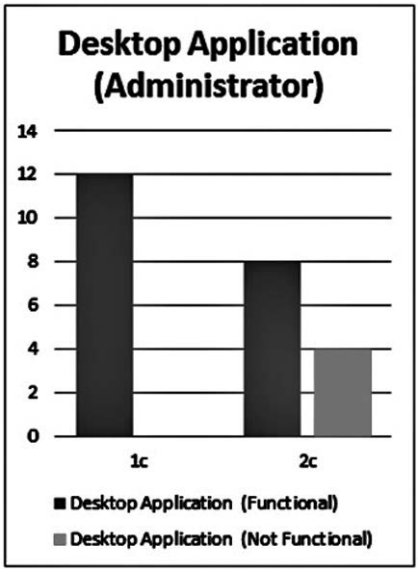

Figure 8. Results of Test Case for Desktop Application (Administrator)

Figure 8 shows the testing results for two (2) test cases tested by twelve (12) administrator respondents. The researchers observed that most of the test case 1c was functioning well while 2c are not. Image recognition is not that accurate and precise but researchers observed that the test case 2c as a better result generating eight (8) out of twelve (12) images that has been recognized with cigarette.

During the proposal defense, the panel suggested to host online the web application to create reliable testing of the system and in the development of the project, the researchers sited the following findings on web, Android and desktop application. After the researchers total the results of the different test cases the overall evaluation of the test are shown below:

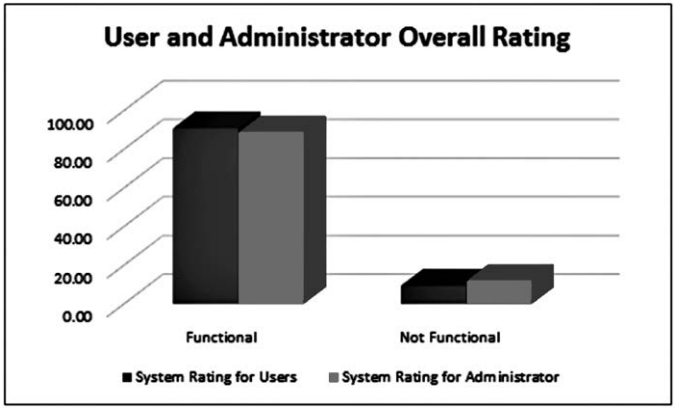

Figure 9. User and Administrator Overall Rating

Figure 9 shows that 88.41 percent (%) of the admin and 90.70 percent (%) of the user respondents find "Mobile Based Cigarette Smoking Incidents Surveillance with Mapping System" useful in helping the ordinance "No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance".

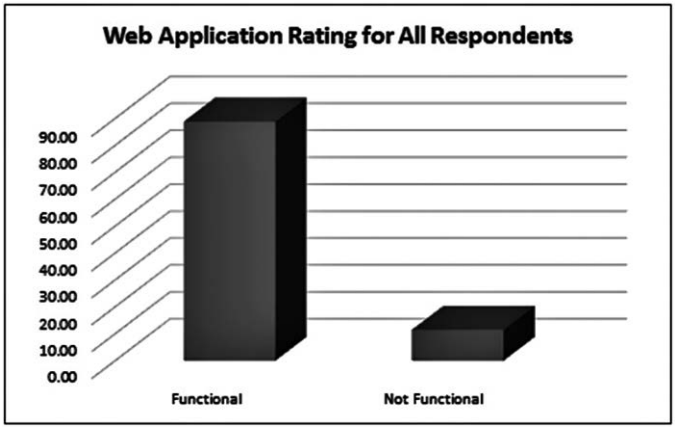

Figure 10. Web Application Rating for All Respondents

Figure 10 shows that 88.67 percent (%) of all the respondents find ease in accessing the website. However, some of the respondents gave remarks such as “lacking of catchy design” and “slow loading” in test case 3-a (Register Form) and test case 4a-1 (Feature: Google Map) respectively, add more information on test case 8a, takes time to load. Also, an admin noted that “In sending photos make sure that span of time is convenient.”

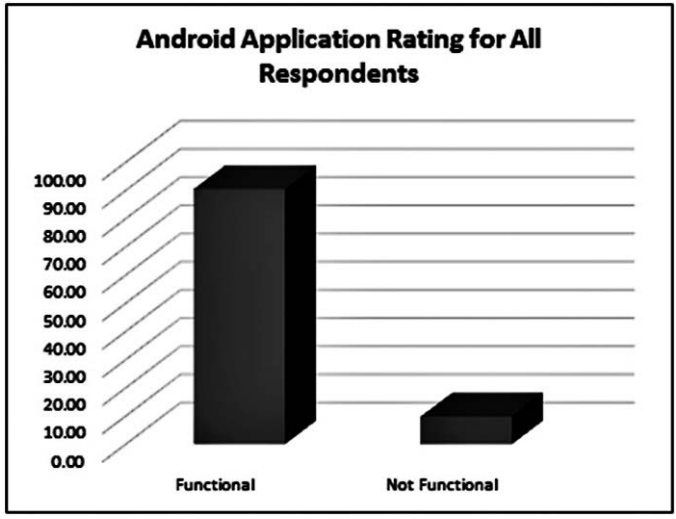

Figure 11. Android Application Rating for All Respondents

Figure 11 shows that 90.39 percent (%) of all the respondents find the Android application helpful in creating an awareness on how cigarette smoking affects the community of Davao City with the remarks of “ that the researcher must create a video online or offline presentation on how to capture cigarette image properly” in test case 10b (Button: How to).

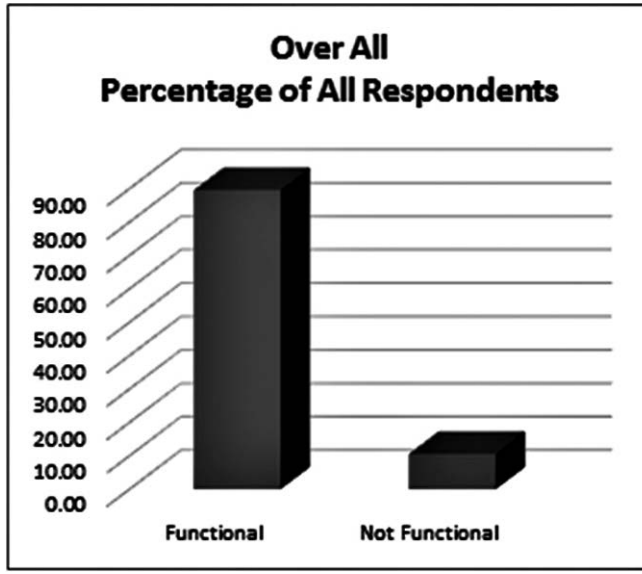

Figure 12. Overall Percentage Respondents

As shown in Figure 12, the researchers found out that 88 percent (%) of all the respondents are satisfied about the research.

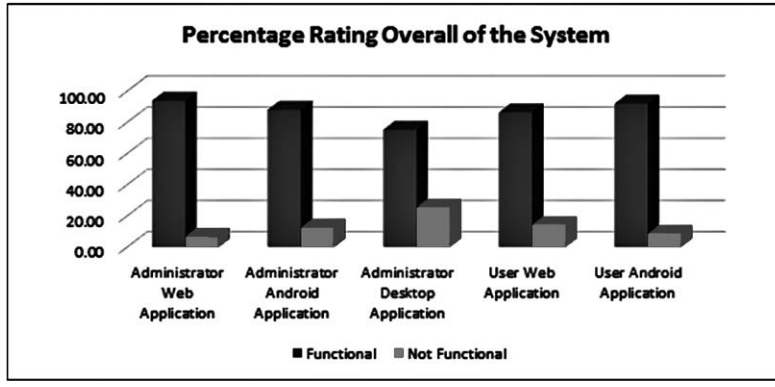

Figure 13. Percentage Rating Overall of the System

The results shown in the Figure 13 are for the web, Android and desktop application covering both the administrator and user modes. It returned the following averages:

Table 2. Numerical Results of Administrator Mode of Figure 13

ADMINISTRATORS		
WEB APPLICATION 86%	ANDROID 92%	DESKTOP APPLICATION 75%

Table 3. Numerical Results of User Mode of Figure 13

USERS	
WEB APPLICATION 93.75%	ANDROID APPLICATION 87.5%

After some series of testing, the researchers were able to simulate a surveillance mapping system in Davao City with a cigarette recognition test and successfully attached to the desktop application with image processing functions provided by EmguCv.

```
for (int r = 0; r <= 24; r++)
                {

 SURFDetector surfParam = new SURFDetector(500, false);

                    Image<Gray, Byte> modelImage = new Image<Gray, byte>("jesher" + r +
".png");
                    //extract features from the object image
                    ImageFeature[] modelFeatures = surfParam.DetectFeatures(modelImage, null);

                    //Create a Feature Tracker
                    Features2DTracker tracker = new Features2DTracker(modelFeatures);

                    Image<Gray, Byte> observedImage = new Image<Gray, byte>("bsmoke.jpg");
                    Random ptss = new Random();
                    Stopwatch watch = Stopwatch.StartNew();
                    // extract features from the observed image
                    ImageFeature[] imageFeatures = surfParam.DetectFeatures(observedImage,
null);

                    Features2DTracker.MatchedImageFeature[] matchedFeatures =
tracker.MatchFeature(imageFeatures, 1, 40);
                    matchedFeatures = Features2DTracker.VoteForUniqueness(matchedFeatures,
0.8);
                    matchedFeatures =
Features2DTracker.VoteForSizeAndOrientation(matchedFeatures, 1.5, 20);
                    HomographyMatrix homography =
Features2DTracker.GetHomographyMatrixFromMatchedFeatures(matchedFeatures);
                    watch.Stop();

                    //Merge the object image and the observed image into one image for display
                    Image<Gray, Byte> res = modelImage.ConcateVertical(observedImage);

                    #region draw lines between the matched features
                    foreach (Features2DTracker.MatchedImageFeature matchedFeature in
matchedFeatures)
                    {
                        PointF p = matchedFeature.ObservedFeature.KeyPoint.Point;
                        p.Y += modelImage.Height;
                        res.Draw(new
LineSegment2DF(matchedFeature.SimilarFeatures[0].Feature.KeyPoint.Point, p), new Gray(0), 1);
```

Figure 14. Asift Algorithm for Image Recognition in C#

During the quality testing, the researchers discovered that different lighting condition affects the image processing of the system. The image processing of the system varies on a certain lighting condition that cannot be measured nor be distinguished. This is because there is no exact lighting intensity or measurements that are present for image processing to which the computer vision will adapt.

The researchers also found out that the recognition process also varies on the distance which has become a delimitation of the system.

The system only consumes 17.5mb of disk space. When the system is running on background/tray, the average amount of memory usage ranges from 30,000k to 70,000k which is just equivalent to a web browser with one tab opened e.g. Youtube. Based on the respondents' laptop models, the average maximum installed memory is 2GB (stock memory).

Table 4. Internet Connection

INTERNET CONNECTION	
Slow	**Fast**
Android Application	
It takes time to send images and may cause failure to pass data to the server.	Faster to send images and data to the server.
Web Application	
Slow results and viewing the in generating maps.	Faster generating results and viewing the maps.
Desktop Application	
Slow download of images to be recognized.	Fast download of images to be recognized and updates database quickly.

Without stable Internet connection, the operation or the process inside the system will be stop eventually and will only continue until Internet will become stable. The system with a speed of a Digital Subscriber Line higher or equal to 1megabytes per second (mbps) would be better for the operations of the systems to work properly and attain the best results, thus, creating consistent and precise surveillance mapping system.

The researchers observed from the Davao City Police Office and Department of Health that their data are not that updated. Some of the residents in Davao city are not aware of the new comprehensive ordinance about the anti-smoking ban. Their data also did not thoroughly explain how a certain case of study is categorized by time and place. In the web application, the respondents can view all the facts and information such as statistics of top 5 places where many cigarettes where captured on the same places, markers or spot of cigarette captured images focus on Davao city map but requires Internet connection to function and also the user should avoid using the Internet Explorer because there are some known issues that is present in the Internet

Explorer integration of Google Maps, and also disadvantages about smoking. In addition to the mobile based system the researcher created an Android application which interacts with the web application, the respondents can view facts and information about the Ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance, disadvantages of smoking and its related diseases and can capture images and send to the web application that are verified by an cigarette image recognition on desktop application and update. If the image has cigarette it will update the web application then a new data entry has been verified else the image will be deleted manually by the administrator.

In capturing images, the researchers encountered some problems that was discuss on the researchers finding's. It has to be in well lighted area and at least 1 meter (m) away from the camera to create visible points for the cigarette image recognition.

In addition cigarette recognition is based on model key points to create a reliable and robust image recognition system thus more image models creates better accuracy but it always depends on the hardware specification of a device in implementing the system.

Table 5. Hardware Specification

COMPUTER SPECIFICATION		
Type of Device	**Desktop**	**Laptop**
System Model	A55MLV	HP G62 Notebook PC
Operating System	Windows 7 ROG Rampage (64 Bit) (E3) 64-Bit (6.1, Build 7601)	Windows 7 Ultimate 32-Bit (6.1, Build 7601)
Processor	AMD A6-3500 APU with Radeon(tm) HD Graphics (3 CPUSs), ~2.1 GHz	AMD Athlon(tm) II N330 Dual-Core Processor (2 CPUs), ~ 2.3GHz
Memory	4048MB RAM	2096MB RAM
Display Name	AMD Radeon HD 5500 Series	AMD M8806 with ATI Mobility Radeon HD 4250
Model Images for image recognition	50	25

The accuracy of cigarette recognition is achieved by the observance of the following recommendations in the implementation of the system:

- Distance from video cameras to object – 1 meter (m).
- Size of cigarette: not less than one-third (1/3) height of sequence
- Uniform illumination of the observed cigarette image
- Absence of rear gating and solar rays in field of sight of camera
- Sufficient clearness and contrast of image in database
- Clarity and the contrast of photographs in database

In capturing images, one must have a stable Internet connection to prevent data loss and to send the captured images with ease. This is also important for the system because it will consume lesser time in capturing images and can leave the other users in the queue of sending data on the web server. During the testing period of the research, the researchers discovered that the system can also be used to determine the interests not just the Davao city but other cities across Mindanao

for it create an awareness of upholding healthy living in big cities just like Davao city . But sadly, because of the lack of time, the researchers were not able to let some of the residents of district two (2) and three (3) take the test.

After series of experimentation, tests and analysis about the "Mobile Based Cigarette Smoking Incidents Surveillance with Mapping System" developed by the researchers they have come up with the following conclusions:

The "Mobile Based Cigarette Smoking Incidents Surveillance with Mapping System" was able to promote health awareness through disseminating the information on Android and web application.

As defined, there were six (6) specific objectives in this study and below are the solutions:

1. To help the New Comprehensive Anti-smoking Ordinance and to promote public health awareness in smoking related cases and diseases in Davao City.

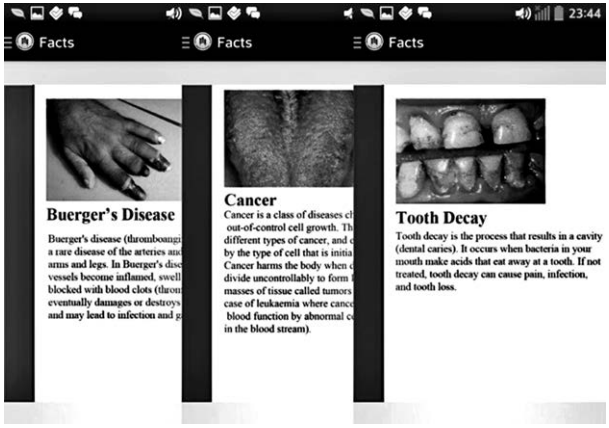

Figure 15. Android Causes and Effect of Smoking

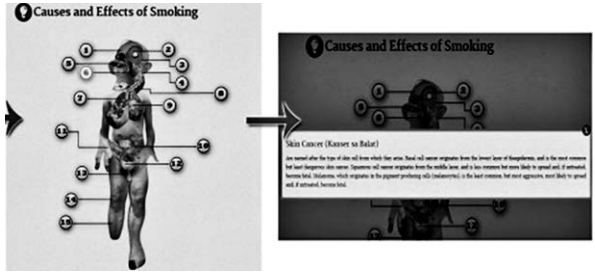

Figure 16. Web Application Causes and Effects of Smoking

One of the modules of the system is to broadcast an information page which is shown in Figures 15 and 16. The former is for the Android and the latter is for the web application. The page provides information on smoking-related diseases such as Buerger's disease, cardiovascular disease, heart disease and more smoking-related diseases.

As shown in Figure 16, the researchers have created an image with numbers in each part of a human body in the web application. Upon clicking the numbers, it will display the corresponding disease that may happen in the selected part of the body. Through this scheme, the user will be aware of the disadvantages of smoking.

2. To create an Android mobile application that promotes vigilance to implement the ordinance "No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance".

Figure 17. Android Application Capture Image

As shown in Figure 17, capturing images is one of the modules of the system. In promoting vigilance, the researchers created an option to capture images of thrown cigarette in public places of Davao city. These captured images are datum that will help the system to develop a surveillance mapping system.

3. To develop a desktop application that recognizes cigarette butt or cigarette in the capture images.

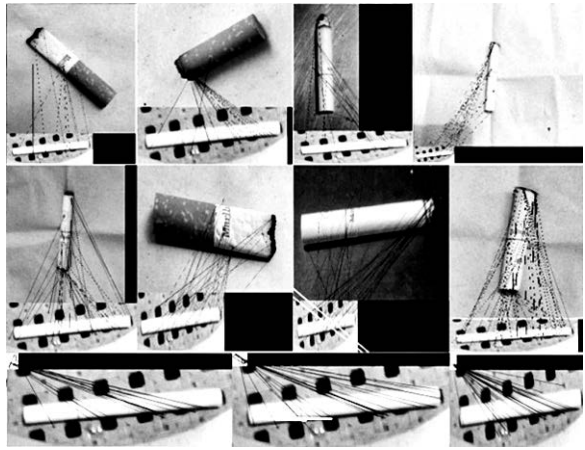

Figure 18. Cigarette Image Processing

Shown in Figure 18 is the cigarette image processing. Image processing is one of the modules of the system. The image that has been sent by the user will be automatically recognized if the image has cigarette or none through the desktop application.

4. To develop a web application with Mapping System that monitors and locates cigarette smoking incidents.

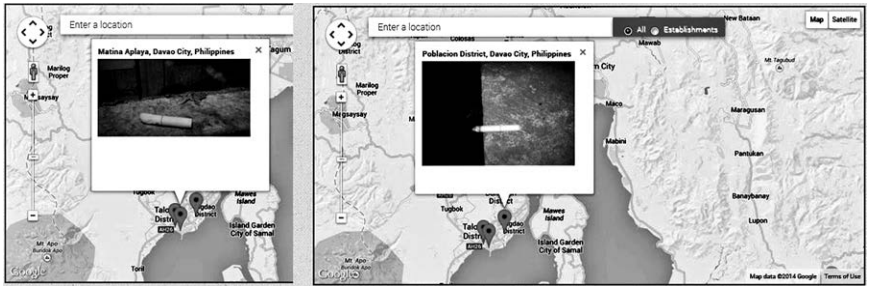

Figure 19. Mapping System

Shown in Figure 19 is the Mapping system powered by Google Map API which has been embedded in the web application. The image that has been recognized in the third objective has a corresponding data which is the latitude, longitude and time.

The latitude and longitude will be the place and will be marked in the Google map API focused on Davao city where the cigarette has been captured in line with the time when the cigarette has been captured by the user. The map will be monitored by the administrator.

5. To develop an Android mobile application that locates the concurrent location through GPS (Global Positioning System) of the captured image of a cigarette butt or cigarette that offended the Ordinance No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance.

In capturing images, the GPS must be turned on in order to have a current location that will be sent in the server. GPS has two data inside; one is the latitude and the longitude which will be displayed by clicking the camera view button of the Android application.

6. To develop a web application that automatically generates statistical count of recognized cigarette butt or cigarette in public places for DCPO's and DOH's perusal.

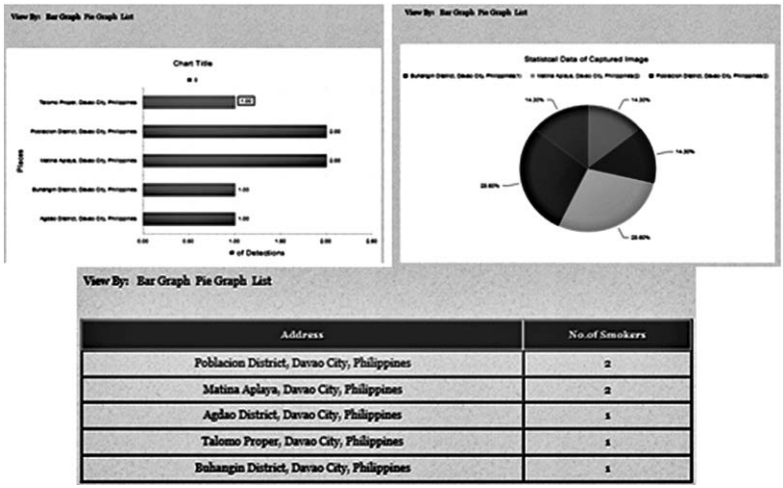

Figure 20. Statistical List, Bar and Pie graph

Shown in Figure 20 is the Statistical list ,bar and pie graph, the data which are the recognized image, the GPS and the time when the image was captured that has been updated by the desktop application will be the source of generating statistical count, pie and bar graph exclusive in Davao city. The statistics will display the top five places of numerous captured cigarette incidents.

After series of experimentation, tests and analysis about the "Mobile Based Cigarette Smoking Incidents Surveillance with Mapping System" the researchers, have come up with the following conclusions:

The "Mobile Based Cigarette Smoking Incidents Surveillance with Mapping System" was able to create a technology of solution in addressing the ordinance "No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance" and was able to promote

health awareness through disseminating of information on android and web application.

RECOMMENDATION

For the future researchers, the group/researchers recommend to enhance the application's availability not only in Davao City but also to those cities who are strictly implementing smoke-free policy, have an update of the places that has a huge amount of smokers every weekend, in sending image the process should be quick. In addition, displaying online map in Android phone would have an easy access and quick updates for places and markers of captured cigarette images.

The researchers as well recommend searching for further studies to focus on enhancing more than one (1) meter (m) distance between the object and the camera in capturing images and have an update of the places that has a huge amount of smokers every weekend. Creating an interaction message relay between respondents and administrator in Android phones may produce a viability of communication that will promote a massive awareness about the ordinance "No. 0367-12, Series of 2012, known as The New Comprehensive Anti-Smoking Ordinance".

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EDUCATIONAL TECHNOLOGIES

A WEB BASED APPLICATION FOR ASSISTING STUDENTS SELECTION OF HIGHER EDUCATION DEGREE

Win Lawrence Ferolin, Jessa Mae Fuentes,
Joy Faith Prieto, John Paul Sarabia, Kristine Mae Adlaon

In the present, there are a lot of students enrolled in colleges and universities without really knowing if that course they take is fitted to their capacity and skills. There are also students who have been dropped out and shifted in a university and colleges, by the reason that some students enrolled in college taking the course influenced by their parents and friends; some are enrolled because they liked the course. With regard to the identified scenarios, the researchers decided to develop a Web-based application for assisting the student's selection of higher education degree through a form of an interest test. This web based application will be able to help students know what colleges and universities are offering their suggested courses (based on their interest test result) within Davao City. Following the research design used by the researchers, several activities were conducted to somehow solve the identified problem through the development of the web based application integrating Interest Test. After a series of testing with the developed application, testers and target users of the system majority agreed the usability and efficiency of the project. As a result, Guidance office administrators suggested the full blown deployment of the system attributing to the success of the project.

Keywords: *Colleges, university, Davao City, web-based application, Interest Test*

A 3RD PARTY APPLICATION NOTIFIER FOR THE INFORMATION TECHNOLOGY EDUCATION STUDENTS OF UNIVERSITY OF THE IMMACULATE CONCEPTION

Jennifer Buhian, Ma. Cecilia Carreon, Ardel Van Luzarito, Resty Malinao, Rafael Joseph Rivera, Ceasar Ian Benablo

Information is vital to any organization. The process of disseminating information is usually done through manual process and uses only selected medium. As such, it needs to be improved through the use of various media to make it more effective. The purpose of this study is to develop a third party application, an alternative to the existing e-learning management system, that will help the Information Technology Education students of the University of the Immaculate Conception be informed of any posted materials, activities and announcements. The purpose of the application is to notify the students whenever new updates are made in any of the subjects they are enrolled into. The application can save the links (uniform resource locator) of the subject that they want to be notified with. The application will automatically check if there are new downloadable files that are found in the identified subjects provided that Internet is available.

Keywords: *Third party application, uniform resource locator, notification*

D'MATH: A STRATEGIC BOARD GAME BASED ON DAMATH

Jan Robert Chua, Lady Red Ivanna Drueco, Loreto Miguel Paragoso, Shanice Hanna Lea Prochina, John Marco Pitlo

The development of mobile applications for various purpose has been proven to have increased over the years. With the increasing population of mobile device users, mobile application development has become one of the trends. Among the different applications being developed are games – targeting not only the young people but almost all ages, both genders factored in. The researchers took this as an inspiration and came up with the idea of developing a game to promote and the famous mathematical game Damath. During the development, the researcher used Adobe Illustrator and Photoshop CS6 for the character design and sprite sheet, Corona SDK for the simulation of the game and Lua for the programming language, and TexturePacker for code generator for sprite sheet. After the development, the application was tested and the test has shown positive results. The researchers of this study concluded that the game D'Math helps pupils gain interest on the game and has helped teachers as an effective teaching tool.

Keywords: *Damath, mobile applications, Adobe Illustrator, Photoshop CS6, Corona SDK, Lua*

HANDYNOTE: SMS-BASED EVENT NOTIFIER WITH INTERACTIVE RESPONSE CAPABILITY FOR STUDENTS INQUIRY

Charlemagne Amoroso, Johndro Gregorio, Jonas Ladera, Elvin Chester Medel, Jayson Nobleza, Ceasar Ian Benablo

Information today is very important especially in academic institutions like schools and universities. Students are updated through the information posted in the bulletin boards. As the researchers conducted a survey in the University of Immaculate Conception among Information Technology students regarding the effectiveness of the use of the bulletin boards, the researchers found that several students find the bulletin boards alone are inefficient. When announcements are posted in the bulletin boards, some students mostly rely on texts messages from their classmates rather than checking it personally. Hence, the researchers came up with this study which aimed to aid the students in getting the necessary information of posted announcements without necessarily checking the bulletin boards. As an offshoot of the study, a desktop application that uses a modem as a third party to send messages to students via Short Messaging Service (SMS) was developed. It can interact with students by means of processing student's inquiry using specific keywords. Keywords are pre-defined so that the application can process the inquiries specifically and provide the best output.

Keywords: *Bulletin board, text messages, keywords, Short Messaging Service*

MATHPROBE: A WEBBASED INTERACTIVE LEARNING PLATFORM FOR SIXTH GRADE MATHEMATICS

Rachelle Lorraine Ando, Jed Brian Brodith,
Guy Romelle Magayano, Justine Ryan Palomar, John Marco Pitlo

The Philippines has been continuously improving its education system. This is made evident with the implementation of outcomes-based education and K-12. It is with the aim of directing the focus into a more learner-centric approach. Despite this, students still find it difficult to learn mathematics. Its topics are uninteresting making learning it boring to many. This situation poses a great challenge to educators, especially in the primary and secondary education. With this, the researchers found it necessary to create a tool that would somehow diminish the seemingly boring nature of mathematics. By gamifying the learning and integrating it into an open communication system with social interaction and multiple collaborative mentoring, a learner-centric approach can be implemented. By using a constructive approach, the researchers tried to identify the components of mathematics particularly algebra, probability and statistics that can be gamified. A web-based game was created using an incremental software development process model. Various web technologies were utilized which made the tool more interactive. Black box testing was done in a school with the participation of their sixth grade students and mathematics teacher. White box testing was also done to ensure the quality and stability of the tool before deploying it. Results yielded a positive outcome for the evaluators.

Keywords: *K-12 Education System, Web Applications, Learning Platforms, Sixth Grade Mathematics, Algebra, Probability, Statistics, Web Design, Responsive Design, Two-Dimensional Graphics-Animation*

ALGORITHMS, COMPUTATION THEORY, AND APPLIED COMPUTING TECHNOLOGIES

A SOCIAL PHONEBOOK CONTACT NUMBER SEARCH ENGINE ANDROID APPLICATION

Barry Blando, Ronneille Borbon, Shamina Allysa Lindo, Emmanuel John Ramos, Gladys Suazo, Francis Rey Padao

It is a fact that having a mobile phone has become a necessity for people. It offers important functionalities, from the very basic thing of making a call to texting. With the availability of Internet among mobile phones, it has made these mobile devices become more in demand. In this study, the researchers focused on finding a better way of collecting contact numbers easier through the use of modern technology. The researchers developed a smart contact finder Android application that serves as a search engine for finding contact numbers. With the application, the user must create his own account and provide his contact number, username, password and full name. In order to use the search engine, the user must synchronize his contacts to the application. The user can set his account setting into private or public. The application has the ability to recommend contacts to users. By generating manually computed output and comparing it to the actual output of the application, the researchers have proven that the application is in fact generating the expected output. The test results also proved that the application's accuracy and efficiency as desired contacts remain to be found on top of results list over and over again, regardless of the increase of total number of results.

Keywords: *Mobile phones, contacts, Android, Android application*

ANDROID MOBILE APPLICATION FOR DISEASE TRACKING INFORMATION

Rhoda Beltran, Zenia Elyn Grace Gedalanga,
Mark Anthony Sanchez, Leonel Zedric Ramirez,
Ian Carlo Jerson Yap, Nikko Paolo Gumia

Davao City, located at the Southern part of the Island Mindanao, is one of the largest cities in the Philippines. A lot of health programs and medical missions are conducted every month to promote good health and provide knowledge regarding updates of health threats such as newly discovered diseases. However, some distant areas are not easily reached by these programs. With this, the researchers came up with a study that looks into incorporating modern technology with healthcare services. Modern technologies such as those of geographical positioning systems, geo-information systems, and heat-mapping have collaborated with the medical fields to create health systems that survey and monitor the health status of the world or of a certain place and to try to locate a pattern regarding a trending disease, to come up preventive measures to avoid disease outbreaks, to present statistical surveys regarding the monitoring of the health status, and to give reports based on data collected by surveys. Tools were developed by professional systems and web developers to handle these tasks automatically, accurately, and deliver clean and polished results. Health Map, one of the many information systems developed by IT professionals with the collaboration of the World Health Organization (WHO) has provided up-to-date spatial data that are concerned with public health system, the public are now resourceful because of these new inventions that are free, handy, and accessible anytime, anywhere if internet connectivity is present.

Keywords: Davao City, health, disease, geographical positioning systems, geo-information systems, heat-mapping

DAVALERT: AN ANDROID APPLICATION FOR DAVAO CITY ROAD ADVISORIES

Karla Librero, Brydel Mae Macatabog, Zabdiel Salahid, Allen Gae Salutillo, Shenna Rhea Maranguit

Some of the problems encountered by private vehicle owners and commuters in Davao City are lack of information on current traffic and road situations, and traffic congestion. This study aimed to develop an application that can provide motorist the necessary information on roadblocks such as closed roads, roads under construction, vehicle accidents, floods, and special events, and traffic weights on the major roads of the city. The researchers, throughout the development of the application, followed the Scrum Development Process Model for the methodology since it is a flexible product development strategy. This application consists of a web component to be used and updated by an administrator, and a mobile application component to be used by private vehicle owners and commuters. User acceptance tests were performed confirming that the project works as it was intended to. This application is believed to be beneficial to the Traffic Management Center (TMC) of Davao City in terms of information dissemination of current road advisories, and to the people visiting or living in the city as it would enable them to avoid paths that may have heavy traffic or other road blocks; thus improving their overall travel experience.

Keywords: *Vehicle, roadblocks, road advisories, Scrum Development process model*

DAVAO CITY LAND LOCATION EVALUATION: AN INTERACTIVE RISK ASSESSMENT AND HAZARD MAPPING

Luzviminda Bije, Mary Mae Caloyon,
Elixer Jon Rodil, Exander Barrios

Davao City's economy has risen significantly and it has brought job opportunities to the people. Along with this, newly built infrastructures were also sprouting within the city. Safety of the area before building the infrastructures must be first taken into consideration to secure the lives of the people. Hence, the researchers came up with this study that aims to develop an application to aid land developers, geologists, and residents of Davao City in assessing the geologic safety of an area. The web application system uses Google Maps API V3 to display areas in the city which are prone to geologic terrestrial hazards. It can also display the soil and rock map of Davao City. The application also caters online request and release of Geological Assessment Certificate which is a requirement by the Department of Environment and Natural Resources (DENR) before constructing new infrastructures. The researchers gathered requirements and information from Mines and GeoSciences Bureau (MGB Region XI).. The application was tested by the Geologists and IT Staff of MGB, Laboratory Technician of Department of Agriculture, Civil Engineer instructors of the University of the Immaculate Conception (UIC) and other individuals.

Keywords: *Infrastructures, safety, web application, Department of Environment and Natural Resources (DENR)*

GARBAGE COLLECTION POINTS LOCATOR FOR ANDROID APPLICATION

Mark Anthony Castro, Lucky Gabriel, Ryan Jamero, Michael Ryan Macasaet, Vincent Anthony Rivera, Shenna Rhea Maranguit

Recently, the technology brought remarkable tools to aid people to live conveniently and easily. Some of these technologies made even greater impact as manifested by its growing users. Android device and Google applications like Google Map are just a few. Both have helped people in various ways. The purpose of this study was to create an Android application that would display all garbage collection points and suggest the nearest garbage collection points based on your current location using the Google Map. The 4D model was used by the researcher to guide the development of this application. There are two components of the system, the web component for administrator and the android component for user. User acceptance test was conducted to validate the requirements of specification of the system. The result shows that the application functions well if the android device has updated Google Map, higher version of android API, and strong Internet connection. In conclusion, the study was able to partially solve the problem of proper disposal of solid waste materials through enabling the community to locate the nearest garbage collection point and CENRO to disseminate the updated garbage collection point.

Keywords: *Android, Google Map, Application Programming Interface (API), 4D model*

iVerify: SIGNATURE RECOGNITION AND VERIFICATION FOR ANDROID PHONES

Cuyos, Lanz Anthony B., Jamoner, Ryan Cris E., Siojo, Rod Vincent S., Quiño, Daniel Ryan D.

Signature forgery counterfeit making or fraudulent alteration of any writing and may consist in signing of another 's name or deceive others. The alteration of such as confidential documents with the intent to deceive of their legal, or property rights is unacceptable. A handwritten signature is a way of identifying a certain person which authorizes the person to acquire documents and transactions. A human handwritten signature is a special case which includes special characters and flourishes. Handwritten signatures are a kind of artistic handwriting objects. Hence, the researchers came up with the study that aims to reduce the number of signature forgeries in different establishments of the community, with the name, iVerify: An Offline Signature Recognition and Verification for Android phones. As an offshoot of the study, an offline Android application that scans a handwritten signature in a certain document was developed. The scanned signature is trained in the Artificial Neural Network to be recognized. After it has been recognized, it will verify another signature and compares it with the recognized signature. This capstone project was tested by the researchers through Boundary Value Analysis (BVA) and it was successful and ready to be implemented.

Keyword: *Signature, signature forgery, Artificial Neural Network, Boundary Value Analysis (BVA)*

ONLINE BUS RESERVATION AND TRACKING SYSTEM

Tommy Abadilla, Nico Dedicatoria, Aldem John Plana, Riza Mae Sinangote, Nikko Paolo Gumia

Devices nowadays are much of a help to mankind and makes life for them easier. Some of which was made specifically to entertain and educate each individual. These innovations have been used to various areas including transportation. Travelling through a bus has its different kind of approach. Not all bus companies have their own fixed schedule of departure time. Some would wait for passengers to fill in the seats as many as possible before leaving the terminal while some would pick up passengers along the way. While the approach varies, all share one commonality – that is to provide people the best service possible. Seeing some opportunities, the researchers conducted this study to improve how bus companies offer services to clients. The researchers developed a bus reservation and tracking system as an alternative tool to the manual purchasing of tickets and to address the difficulty of determining the current location of buses on travel. Guided by both the chosen research method and the software process model, the researchers conducted interviews among the people from a selected bus company to understand the different processes within the company. The application was made online for the reason that Internet has become widespread, thus, access would not be a difficulty.

Keywords: *Entertainment, transportation, bus reservation and tracking system*

WEB-BASED TWITTER DATA EXTRACTION AND SMS NOTIFICATION FOR WEATHER CONDITION UPDATES

Mary Joy Aleria, Wendy Belle Arellano,
Jessa Mae Jagualing, Reuben Laude,
Rauberly Jane Malamog, Eric John Emberda

Social networking sites serve as a big part in our society today. Many organizations are using this as a means of disseminating information and endorsement to the public. Many Filipinos have used social media, and even government agencies such as PAGASA-DOST also used it to inform the public about its weather forecasts. However, due to climate change, people are unable to prepare against disasters. Many are too preoccupied to get updates from various media such as the Internet, radio, and television. One possible disaster risk reduction measure is through SMS communication, since it doesn't rely on Internet, radio, and television signals. The researchers developed a tool to help the people get informed about the current weather condition with the use of SMS Notification. A web-based tool was created which reads PAGASA-DOST's Twitter feeds in an automated fashion, and alerts registered users about the current weather condition in their location. An SMS messaging Application Programming Interface was used for the automated SMS notification. The tool was tested by various users with the use of test cases. The results of testing the tool were significantly positive. It provided an alternative means of weather update through SMS, whether your phone is a Smartphone or not.

Keywords: *Social networking sites, Smartphone, SMS notification, Application Programming Interface (API)*

NETWORKING TECHNOLOGIES

ParCon: AN ENHANCEMENT PARENTAL CONTROL APPLICATION TO MONITOR CHILDS' ONLINE ACTIVITY USING ANDROID APPLICATION

Lovelyn Catubigan, Jebie Desales, Salvie Madulara, Marigold Usaraga, Chester Mark Villamor, Ceasar Ian Benablo

Monitoring online activities of children is something parents are now concerned about. With the Internet containing different kinds of information, it is sometimes difficult to filter those that are harmful from those that are not. Several technological advancements have been innovated to address such concern of parents. One study in the University of the Immaculate Conception once attempted to create the same. Though the study was able to create a monitoring application, it was observed that some limitations are to be addressed. This study was conducted to look into the existing application, the result of the previous study, which helps parent have control over their children's online activities. The general objective of this study is to enhance the existing application and to address some of the recommendations of the previous study to offer additional features that are essential for the betterment of the application. In order to identify better functionalities, the researchers did use the existing application. In the course of the study, some flaws of the existing application were addressed and a few additional features were added. To ensure its functionality, the application was tested. The results showed that there was indeed an improvement from what the existing application was capable of doing.

Keywords: *Monitoring, Internet, parental control*

UNIFIED ATTENDANCE MONITORING USING RFID

Roan Dela Cerna, Anjo Montesclaros, Susuki James Ruiz,
Charlotte Amalie Quiñones, Carlos Villanueva,
Ian Van Villena, Nikko Paolo Gumia

The University of the Immaculate Conception (UIC) is divided into multiple student organizations: namely the Student Supreme Government (SSG), the Office of Student Affairs and Discipline (OSAD) and several programs. Each of these organizations manages events, meetings and other student gatherings. The attendances of students are collected to monitor the frequency of the students attending. Each organization uses different techniques on collecting students' attendances. The most commonly used in all of those approaches is the distribution of attendance slips. The researchers came up with a study that aims to provide an alternative way of collecting student's attendance and to unify the medium used into single item which is the student's ID. This can be achieved using the Radio Frequency Identification (RFID) technology. The researcher of the study developed two applications: the UniAMS desktop application and UniAMS web based application. The desktop application uses an RFID reader and a web camera. The purpose of the web camera is to capture an image of the student who will login and the image data as a validation proof. The web based application is used to monitor the attendance collected in the desktop application. It can be accessed on the internet using Cloud Computing technology.

Keywords: *Student organizations, attendance, Radio Frequency Identification*

ENTERTAINMENT AND MULTIMEDIA TECHNOLOGIES

A MOBILE BASED INSTRUCTIONAL GUIDE FOR BLACK RICE PLANTING

Charlagne Aduana, Kris Amor Capinda, Jay Ann Imbo, Rheamie Raper, Shanie Grace Sumawang, Daniel Ryan Quiño

There are currently different rice types available today with the most common one being the white variety. Out of all the types, however, black rice is found to be the one containing the highest amount of nutrition that helps with growth. Very little people know about the importance of black rice, so the researchers want to provide information through an application about the benefits of black rice. The method used throughout this study is Descriptive-Qualitative Research Method because it aims to solve the problem by conducting interview, data gathering and document reviews and the process model use for developments is a 4D process model, the researchers conducted a simple survey about the mobile application with 33 farmers and consumer from Calinan, Davao City. The researchers used a simple survey questionnaire to know the effectiveness and reliable information of mobile application. Based on the results of the survey, the majority of farmers do not know about the existence of black rice, they were only familiar with the varieties of white rice and providing a mobile application will help in this matter.

Keywords: *Rice, nutrition, Descriptive-Qualitative research method, 4D process model*

DC RUN: A DAVAO CITY 3D PROMOTIONAL GAME

Darren Joseph Bayona, Earl Sayson, Lyle Uy, John Marco Pitlo

In the world of the advertising industry, we receive information through various means be it, banners, signage, television, radio or any other printed & digital media. It is a common and widespread practice for various establishments or businesses to gain an economic edge over others. Over time, innovations in technology, such as games, have come to make an impact to the advertising industry, most especially tourism, and has proven to be a major catalyst in gaining the attention of the public eye. This is true particularly in Davao City. The researchers took it upon themselves to conduct a study whereupon recognition of said important factors in advertising and the need to boost Davao City's tourism by developing an application that will feature Davao's finest tourist spots -- a 3D promotional game featuring some of the beautiful tourist spots in the city. Adapting the concept of endless running, the researcher envisioned bringing forth a game that will definitely bring advertising into a different level. The researchers implemented the game with graphics and character design using Unity 3D and Blender, and developed it as a desktop application. Apart from providing entertainment, users will also be educated with regards to the best tourist spots Davao has to offer.

Keywords: *Advertising industry, games, Unity 3D, Blender*

ENHANCEMENT OF JUMP WITHOUT HESITATION: JUMPING OVER THORNS: A 3D INTERACTIVE ANDROID PHONE GAME APPLICATION

Earl Garvin Dizon, Jamaica Gellica Moraga,
Philip John Ong, Ma. Lou Wella Rolloque, John Marco Pitlo

Nothing is permanent in this world except change. A great many things have evolved into countless forms throughout the existence of technology. Different types of devices nowadays, are of much help to mankind and make life easier, comfortable and pleasant to live with. Game applications are now widely used by people, mostly used to entertain and educate individuals. The researchers conducted this study in order to enhance the features of an existing interactive Luksong Tinik game to further its comprehensive aspect and gain a wider audience range to a more dynamic and realistic 3D approach. The researchers developed an enhanced interactive 3D Luksong Tinik game for Android mobile phones namely "Jumping Over Thorns". The researchers used the iterative research method in conducting this research. Using Adobe Photoshop for the character design, Blender for the 3D models export and animations, and Unity 3D for developing the game. From 2D graphics to a more interactive 3D game environment and characters, multi-player functionality, with power-up features, the researchers envisioned to have an enhancement of the previous Luksong Tinik game into users with the chance to enjoy, be entertained, using mobile technology and is possible in the virtual world.

Keywords: *Luksong Tinik, game applications, 3D, Adobe Photoshop, Blender*

ENHANCING MULTIPLICATION, DIVISION, ADDITION AND SUBSTRACTION CALCULATION SKILLS THROUGH COMPUTER GAMING

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Mathematics is a challenging subject. With how education is now linked with entertainment and Philippines having just recently updated from K10 to K12 standard of education, Filipino educators are faced with the challenge of teaching the new generation of students while learning is the challenge for the latter. With these in mind, the researchers aim to utilize the use of video games to enhance the users' calculation skills and incorporate it to assist the students' education in the basic arithmetic and the MDAS operations. In order to gauge the effects of the MDAS video game, 40 out of 169 grade four students of the University of the Immaculate Conception, Grade School Department in the academic year 2013-2014 were chosen to become the respondents of this study and were divided into the control group and the experimental group. With the help of the respondents' math teachers as the conductors of the pre-test, system testing and posttest activities, the researchers were able to come up with an analysis that proved the importance of math educators. Without a good benchmark of the basic arithmetic, advanced concepts like the MDAS operation would be difficult to comprehend and that the MDAS game is a useful tool to exercise the user's basic arithmetic.

Keywords: *Mathematics, education, video games, MDAS*