OUTCOME/S

O.1. Research outputs are published in refereed journals.

Faculty Research Publication

Name of the Faculty/Personnel	Title of Research/Article	Name of Book/Journal	Date Started	Date Completed	Editors/ Referees (Name and Profession)	Vol./Issue/ Place/Date of Publication/Copyright No.	Level of Publication		
							International	National	Local
De La Cruz, Arvin R. Tenerife, Pedrito Jr. M.	Design and Development of Banana Fiber Decorticator with Wringer	International Journal of Recent Technology and Engineering	2018	2019		Vol.-8, Issue-1S4	√		
De La Cruz, Arvin R.	Optical Character Reader of a Braille Unicode System for the Blind	International Journal of Recent Technology and Engineering	2018	2019		Vol.-8, Issue-1S4	√		
De La Cruz, Arvin R. Tenerife, Pedrito Jr. M.	Image-Based Microalgae Cell Identifier and Counter	International Conference on Innovative Research in Science, Technology and Management Conference Proceedings	2017	2018		Vol.-6, ISSN 2244-5668		√	
Ado, Remedios G. Mahaguay, Rolito L.	Development of e-Bag Wireless Charger for Gadgets	International Conference on Innovative Research in Science, Technology and Management Conference Proceedings	2017	2018	Dr. Teena Bagga	ISBN 978-81-934246-4-3	√		
De La Cruz, Arvin R. Tenerife, Pedrito Jr. M.	Design and Development of a Hybrid Photobioreactor for Biomass Production of Spirulina Platensis Species	International Conference on Innovative Research in Science, Technology and Management	2017	2018	Dr. Teena Bagga	ISBN 978-81-934246-4-3	√		
Tenerife, Pedrito Jr. M. Tubola, Orland D.	The Development of a Hybrid Renewable Energy-Powered Light Bouy System Harnessing Sea Energy Potentials	Ascendens Asia Journal of Multidisciplinary Research Conference Proceedings	2014	2015	Dr. Carmencita L. Castolo	Vol. 2, No. 3 ISSN 2529-7902	√		

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Ado, Remedios G.	"Mobile Emergency Response Application Using Geolocation for Makati Command Center"	International Journal of Computer and Communication Engineering	2013	2014		Vol. 3, No. 4, July 2014 ISSN 2010-3743	√		

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International Journal of Recent Technology and Engineering
Volume 8, Issue 1 Special Issue 4, June 2019, Pages 82-84

Design and development of banana fiber decorticator with wringer (Article)

Tenerife, P.M., Jr. De La Cruz, A.R. Arce, A.C.M. Pabularcon, M.A.N. Ortega, K.M.D. Rafallo, R.L.R.

Polytechnic University of the Philippines, Philippines

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Abstract

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The demand for fiber as raw materials to make various products is increasing. It can be extracted from the seed, leaves, fruits and stem of a plant. Banana is one of the leading fruits grown in the Philippines. It provides food and a source of industrial raw materials. Aside from the fruit, banana blossom and its trunk pith that can be eaten, natural fiber can be extracted in the trunk (pseudo-stem) that is usually thrown as waste after the harvest season. The study aims to develop a machine that can extract fiber in a pseudo-stem which can be used in handicrafts, ropes, clothing and other products. A prototype was designed, developed and was tested for banana trunk fiber extraction. During the extraction process, the stem which is 45.72 cm in length and 1 cm thickness is fed manually in the prototype machine. Fiber is extracted from the pseudo-stem using a decortication process where a roller with scratched surface is compressed into a stationary bar that will crushed and scraped the trunk. During the decortication process the banana stem is also undergoing the wringing process wherein the fiber loses its water content. The extracted fiber is already dried and can be used in making domestic products. However, to have a good quality fiber, after the process, it should be washed and dried. Results indicated that the recovery rate of the banana fiber has increase by 2-3% in an average of 35.5 cm pseudo-stem. The device has a great potential and should be used for the growing fiber industry in the country. © BEIESP.

Author keywords

Bast fiber | Decortication process | Pseudo stem | Wringing process

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Design and Development of Banana Fiber Decorticator with Wringer

Pedrito M. Tenerife Jr., Arvin R. De La Cruz, Alexis Christellene M. Arce, Ma. Arianne N. Pabularcon, Kathleen Meriel D. Ortega, Ralph Lorenz R. Rafallo

Abstract— *The demand for fiber as raw materials to make various products is increasing. It can be extracted from the seed, leaves, fruits and stem of a plant. Banana is one of the leading fruits grown in the Philippines. It provides food and a source of industrial raw materials. Aside from the fruit, banana blossom and its trunk pith that can be eaten, natural fiber can be extracted in the trunk (pseudo-stem) that is usually thrown as waste after the harvest season. The study aims to develop a machine that can extract fiber in a pseudo-stem which can be used in handicrafts, ropes, clothing and other products. A prototype was designed, developed and was tested for banana trunk fiber extraction. During the extraction process, the stem which is 45.72 cm in length and 1 cm thickness is fed manually in the prototype machine. Fiber is extracted from the pseudo-stem using a decortication process where a roller with scratched surface is compressed into a stationary bar that will crushed and scraped the trunk. During the decortication process the banana stem is also undergoing the wringing process wherein the fiber loses its water content. The extracted fiber is already dried and can be used in making domestic products. However, to have a good quality fiber, after the process, it should be washed and dried. Results indicated that the recovery rate of the banana fiber has increase by 2-3% in an average of 35.5 cm pseudo-stem. The device has a great potential and should be used for the growing fiber industry in the country.*

Index Terms— *bast fiber, decortication process , pseudo stem, wringing process*

I. INTRODUCTION

The demands for the use of natural fibers to produce clothes, carpets and other handicraft products have grown tremendously. Various plants are used as a source material for fiber to meet the demands. It is extracted from fruits, stem, and leaves of various plants. In the Philippines, a natural source of fiber is coconut, water hyacinth, pineapple, abaca. A lot of attention has been given to these plants. However, banana (*Musa sapientum*) which resembles and closely related to abaca (*Musa textilis*) is also a good source of fiber.

Philippines is one of the largest producers of banana in the world. Also, banana is the fourth largest commodity that is being produced in the Philippines next to paddy rice, coconuts and native pig meat. With the large scale of banana that is being harvested means that there a lot of banana stems that can be used to produce banana fiber and help local banana farmers for their livelihood.

II. BANANA FIBER CHARACTERISTICS AND PRODUCTS

Physical Properties

Banana fiber has good modulus of elasticity, tensile strength, and stiffness [8].

Other characteristics includes [2]:

- Appearance of banana fiber is like that of bamboo fiber and ramie fiber, but its fineness and spinnability is better than the two.
- The chemical composition of banana fiber is cellulose, hemicellulose, and lignin.
- It is highly strong fiber.
- It has smaller elongation.
- It has somewhat shiny appearance depending upon the extraction & spinning process.
- It is light weight.
- It has strong moisture absorption quality. It absorbs as well as releases moisture very fast.
- It is bio- degradable and has no negative effect on environment and thus can be categorized as eco-friendly fiber.
- Its average fineness is 2400Nm.
- It can be spun through almost all the methods of spinning including ring spinning, open-end spinning, bast fiber spinning, and semi-worsted spinning among others.

Chemical Composition

The chemical composition of banana fiber is cellulose (50-60%), hemicelluloses (2530%), pectin (3-5%), lignin (12-18%), water soluble materials (2-3%), fat and wax (35%) and ash (1-1.5%) [7].

Products

Because of it being biodegradable, banana fiber is use in different products like yarn, fabric, apparel, paper and paper made products, handicrafts and industrial purposes [9].

As stated by Mr. Romeo O. Bordeos Jr. global competitiveness of the Philippine natural fibers depend on the accuracy of classification and grading of fibers produced [1].

III. PROTOTYPE DEVELOMENT

The prototype uses the concept of auto feed system. It consists of keypad, LCD display, rollers, containers,

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emergency stop and conveyor. Keypad was the component used to control the whole system. The numbers in the keypad corresponds to the following tasks: (1) Automatic, (2) Manual, (3) Motor (On), (4) Motor (Off), (5) Conveyor (On), (6) Conveyor (Off). Banana pseudo stem is fed into the prototype. The roller, serves as decorticator and wringer at the same time, was used in stripping the medium. It undergoes adjustments depending on the size of the medium to be fed. The decorticated banana pseudo stem will then fell onto the conveyor. Excess water of decorticated banana pseudo stem that falls in the water container is monitored by a water level sensor. The conveyor brings the decorticated pseudo stem into the output container. All components are connected to a micro-controller unit. The Liquid Crystal Display (LCD) is used for the monitoring the current stage of the process.

Block Diagram

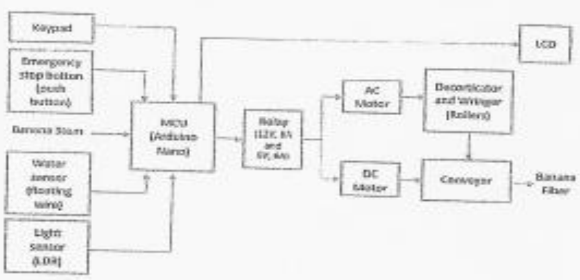

Fig. 1 Block Diagram

Fig. 1 shows how the prototype components are connected. The machine is controlled by a microcontroller Arduino Nano. It has an option whether automatic or manual (user operated). Once a banana stem is placed into the machine and the photoresistor (LDR) sensed it his will turn on the whole machine. The decorticator and wringer are powered by an AC motor to extract the banana fiber. The extracted fiber will go onto a conveyor belt and transferred on a bucket. The extracted water from the stem goes in a container monitored by a sensor. Warning and status of the system is displayed on the LCD. An emergency stop button is included to turn off the whole system once needed. The banana fiber extracted will be dried under the sun.

IV. EXTRACTION MACHINE

Major components of machine are roller, motor, conveyor, and the display. Fig 2a and 2b shows the actual machine.

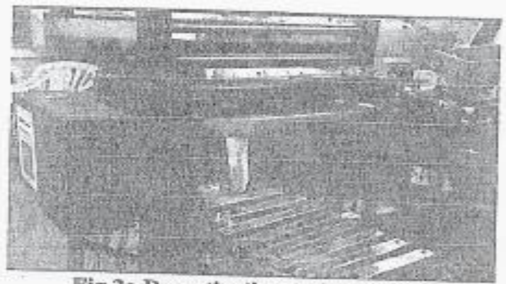

Fig 2a Decorticating and conveyor

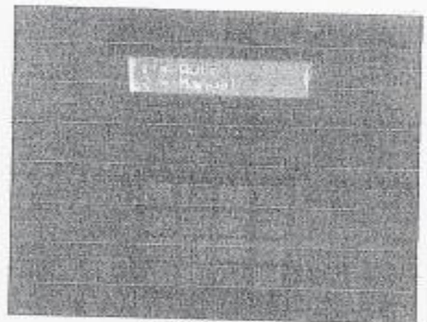

Fig 2b Display

V. TEST RESULTS AND DISCUSSION

For initial testing of the prototype, the proponents used a constant motor speed, and length and thickness of the stem to determine the exact distance of the two rollers needed to achieve the highest fiber recovery range.

Table I. Initial Testing

Length of the stem	Thickness of the stem	Motor Speed	Distance of two rollers	Fiber recovery rate
45.72 cm	1 cm	2800 rpm	8 mm	No fiber recovered.
45.72 cm	1 cm	2800 rpm	7.62 mm	0.01% - 0.05%
45.72 cm	1 cm	2800 rpm	7.112 mm	0.1% - 0.3%

After the initial testing, it was observed that it can decorticate and wring but there was a problem with the motor because it stops in the middle of the process. The motor that was used doesn't have enough torque to drive the rollers continuously. The solution is to add another motor to increase the torque.

Table II. Final Testing

Length of the stem	Thickness of the stem	Motor Speed	Distance of two rollers	Recovery rate

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35.5 cm	1 cm	2800 rpm (2)	7.0 mm	Fiber recovered. 0.4% - 0.5%
35.5 cm	1 cm	2800 rpm (2)	6.5 mm	Fiber recovered. 0.6% - 0.7%
35.5 cm	1 cm	2800 rpm (2)	5.2 mm	Fiber recovered. 0.8% - 1.0%.
35.5 cm	1 cm	2800 rpm (2)	4.0 mm	Fiber recovered. 0.1.5% - 2.5%

The final test results show that the roller should be 4mm apart from each other and 2 motors are needed to extract the fibers from the stem.

VI. CONCLUSION

The developed Banana Fiber Decorticator with Wringer is efficient. By giving attention to the motor speed and the distance of the roller there is an increase in the production rate of the banana fiber. The application of the conveyor and feeder reduces the time and effort of the user.

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Optical character reader of a braille unicode system for the blind (Article)

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Abstract

View references (3)

--This study aspires to innovate braille system by applying the fast coping technological advancement of the world to it. Braille is a code – a system of dots that represents the letters of the alphabet and that visually impaired individuals can use to read independently. As Braille Technology is fast growing, more and more people with visual impairment cannot afford to bought one. Thus, the proponents created a prototype, a portable and a lot cheaper braille device that will help individuals and institutions for their reading challenges. The proponents created a braille display that comes up with a scanner that will scan physical text documents then process it to become an output as a braille cell. It also comes up with a text-to-speech conversion which will become an option for the involved person on what will he or she chooses as an output. This is made possible by Optical Character Recognition (OCR) technology that the proponents used in Raspberry Pi. The OCR is responsible for the image processing that will convert the image captured into a text file. The text file will then be processed again to send signal to the servo motor that is responsible for pushing the braille cells needed. The device also includes motor guide for correct scanning of the physical text documents. The device will perform the task quickly that will surely help visually impaired individuals to easily read reading materials. This system is conducted to provide another solution on problems about reading for blind and visually impaired individuals and to provide cheaper device for them. It will contribute not only to the community involved but also in the technological industry in the Philippines. ©BEIESP.

Author keywords

Braille | Index Terms— braille | Optical Character Reader | Optical character recognition | Raspberry pi | Unicode System

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Optical Character Reader of a Braille Unicode System for the Blind

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ABSTRACT--- This study aspires to innovate braille system by applying the fast coping technological advancement of the world to it. Braille is a code – a system of dots that represents the letters of the alphabet and that visually impaired individuals can use to read independently. As Braille Technology is fast growing, more and more people with visual impairment cannot afford to bought one. Thus, the proponents created a prototype, a portable and a lot cheaper braille device that will help individuals and institutions for their reading challenges. The proponents created a braille display that comes up with a scanner that will scan physical text documents then process it to become an output as a braille cell. It also comes up with a text-to-speech conversion which will become an option for the involved person on what will he or she chooses as an output. This is made possible by Optical Character Recognition (OCR) technology that the proponents used in Raspberry Pi. The OCR is responsible for the image processing that will convert the image captured into a text file. The text file will then be processed again to send signal to the servo motor that is responsible for pushing the braille cells needed. The device also includes motor guide for correct scanning of the physical text documents. The device will perform the task quickly that will surely help visually impaired individuals to easily read reading materials. This system is conducted to provide another solution on problems about reading for blind and visually impaired individuals and to provide cheaper device for them. It will contribute not only to the community involved but also in the technological industry in the Philippines.

Index Terms— braille, optical character recognition, raspberry pi, Braille, Unicode System, Optical Character Reader.

I. INTRODUCTION

Reading is always a challenge for the blind and the visually impaired where they only rely on special books and items that are limited in terms of availability and effectiveness. The blind and visually impaired does not only struggle to read books, articles, or any published materials, physically written papers and signage are just few of those that have little to no use for the blind and visually impaired to use. Their touch is the most important factor for them to read and interact with their surroundings which is why people started to invent electronic devices and applications which communicate with computers and phones in order to provide and help them in using computers and phones, although it is a solution for them to communicate it is only for digital or non-physical means only, this means they are left behind when it comes to physically written, printed or displayed words. Refreshable braille displays are currently available on the market this day. These displays are mostly used in computers to output a text, which means it is only limited to display computerized text. The braille system uses six dots to represent a certain character. Therefore, there will be two (the possible states of the dots, on/off) raise to the power of six (the number of dots) combinations which is equivalent to 64. Therefore, a braille system with 6 dots is capable of displaying 64 different characters. Optical Character Recognition is a technology that is widely used nowadays in various fields. Optical Character Recognition, or OCR, is a technology that enables you to convert different types of documents, such as scanned paper documents, PDF files or images captured by a digital camera into editable and searchable data.

The proponents would like to use this technology to develop a system that will be able to recognize texts from the outside world, and project those texts using a braille display. Blind and visually impaired individual needs to have a proper education just like us. But in our current society, they are rapidly left behind by the rapid growth of education system. Admit it or not, people with disability, especially blind individual can't cope on a normal education system that we have today. It is not because of their thinking capability, it is because it's hard for them to use and apply materials that students use on schools, especially in reading. Maybe there are some who can overcome that obstacle with the help of available Braille devices in the market but, there are many also who are left behind. So the big question is was it enough given that there are many children who are in need of a device that will help them to study? As a solution to that, the proponents want to develop an Optical Character Reader of a Braille Unicode System for the Blind to help them easily read printed materials that will become the first step in making their study patterns easy. It will also serve as the first step in the development of technology in the field of Braille devices and hopefully, the time will come that there are no more visually impaired individual that will be left behind in this society where disability is a disease and education is most important.

II. METHODOLOGY

A. Method of Research

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Figure 1 Research Paradigm of the Project proposal

To improve human conditions of visually impaired persons, the proponents used applied and developmental research. As an applied and developmental research study, it focuses to solve practical problems that will improve human conditions rather than to acquire knowledge. It focuses on analysis and solving social and real-life problems and generally conducted on a large-scale basis. It uses some part of the research communities' accumulated theories, knowledge, and methods. It is used to find solutions to everyday problems, and develop innovative technologies, rather than to acquire knowledge for knowledge's sake. Once an applied research has identified a workable solution to a specific problem the focus shifts to development of a specific product that involves refining the solution to produce a substance that will be effective, safe and appealing and can be manufactured in a timely and cost-effective way.

B. Data Gathering Procedure

Permission to conduct the research will be secured by the proponents from the administrator of the ATRIEV where questionnaires will be distributed to the chosen sample of the institution. The questionnaire will be scored, tallied and tabulated. The proponents and instructors of the institution will guide the persons involved for answering the given questionnaires.

III. RESULTS AND DISCUSSION

a. Functionality testing for Optical Character Recognition

Functionality Testing	First Testing	Second Testing	Third Testing	Fourth Testing
• OCR using Raspberry Pi and Pi Cam	Approximate image to text conversion accuracy is 30%	Approximate image to text conversion accuracy is 50%	Approximate image to text conversion accuracy is 60%	Approximate image to text conversion accuracy is 35%
	Fifth Testing	Sixth Testing	Seventh Testing	Final Testing
	Approximate are converted image accuracy is 55%	Approximate image to text conversion accuracy is 70%	Approximate image to text conversion accuracy is 80%	Approximate image to text conversion accuracy is 90%

Table I shows the functionality of the OCR with a total of 8 testing done. The results are approximately computed based on the factors that are used during the testing period.

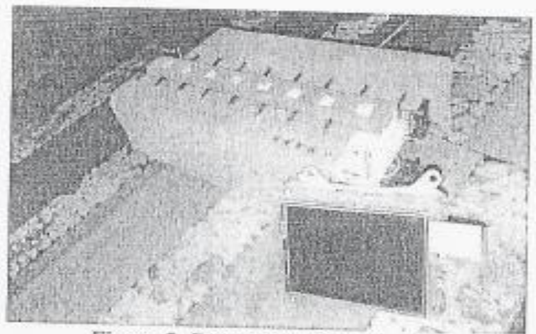

Figure 2. Prototype of the Project

Figure 2 shows the prototype of the project that showcases the braille system and the OCR and Camera that will store all the scanned documents. The device uses an 8 megapixels Raspberry Pi Cam that is installed to the Raspberry Pi, this makes it possible for the user to scan physical texts from documents or printed materials, then it will be processed by the Raspberry Pi. The scanned image undergoes Optical Character Recognition whereas the output is a text file containing all the converted data from the image. The Raspberry Pi then reads this text file and converts it to Braille ASCII, this text file is also read by the Raspberry Pi as an output for the text-to-speech

The Raspberry Pi checks the position of every cell of the braille by reading data from the rotary encoders which are attached to the servo motors on each cell, this position is used to determine the rotation needed for the servo motors to rotate to the correct position. The Raspberry Pi will send signals to the PWM Servo driver to rotate the servo motors for the desired angle. A wheel with magnets lined on its outside wall is driven by these servo motors along with the rotary angle sensors, these magnets attract and repel the pistons that serves as the individual dots. A rumble motor then vibrates to provide a haptic feedback to as the user navigates through the device.

As a feedback and error checking the rotary angle sensors are read again to ensure that the correct position is obtained, the rotary angle sensors are connected to a multiplexer that is then connected to the Raspberry Pi.

b. Weighted Mean (WM) and Verbal Interpretation (VI) of Students, Staffs, and IT Practitioner for Optical Character Reader of a Braille Unicode System for the Blind in terms of Accuracy

Accuracy	Students		Staffs		IT Practitioners		Overall	
	WM	VI	WM	VI	WM	VI	WM	
Correct characters are displayed	3.50	G	3.70	G	4.20	G	3.80	G
Converted text is complete	3.60	G	3.50	G	4.20	G	3.77	G
Word/Words are easy to understand	4.20	G	4.10	G	4.60	G	4.28	G
Overall Mean	3.77	G	3.77	G	3.80	G	3.94	G

Legend: Good(G)

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Table 2 shows the respondents result of the assessment. It shows the results of the developed device based on its functionality. Accuracy table shows the evaluation of the "Correct characters are displayed" with the WM of 3.50 for Students which is Good, a WM of 3.70 for the Staffs which is Good and WM of 4.20 for IT Practitioners which is Good too. "Converted text is complete" has a 3.60 WM for students and 3.50 WM for the Staffs and 4.20 WM for IT Practitioners which are both Good. "Words/Words are easy to understand has both 4.20 WM for the Students, 4.10 for Staffs, and 4.50 for IT Practitioners which indicates Good verbal interpretation. This implies that the developed device meets the functionality specification and requirements of the respondents in terms of different criteria made to be said that the device is functional.

c. Weighted Mean (WM) and Verbal Interpretation (VI) of Students and Staffs of ATRIEV, and IT Practitioner for Optical Character Reader of a Braille Unicode System for the Blind in terms of Efficiency

Efficiency	Students		Staffs		IT Practitioners		Overall	
	WM	VI	WM	VI	WM	VI	WM	
How long the device will last on a daily usage	3.80	G	4.00	G	4.10	G	4.00	G
Characters that the device can output at a time	3.80	G	3.80	G	3.80	G	3.80	G
Overall Mean	3.85	G	3.90	G	3.95	G	3.90	G

Legend: Good(G),

Table 3 shows the evaluation of the respondents which are Students and Staffs on Optical Character Reader of a Braille Unicode System for the Blind on the criteria of the Efficiency. It is evaluated using two (2) criteria to assess if the device can efficiently be used by the users specifically the life span of the device and the output rate of it. Efficiency evaluation table shows in terms of how long the device will last on daily basis usage, achieve a 3.90 WM with a VI of Good and 4.00 WM with a VI of Good for the staffs and a WM of 4.10 for IT Practitioners which indicates Good interpretation. Measuring the characters that the device can output at a time produced a WM of 3.80 for both Students and Staffs and IT Practitioners that indicates a Good interpretation.

This implies that students, staffs and the IT Practitioners agreed that the developed device is appropriate to use, effective and efficient based on their needs in their everyday routine and activities.

d. Weighted Mean (WM) and Verbal Interpretation (VI) of Students and Staffs of ATRIEV, and IT Practitioner for Optical Character Reader of a Braille Unicode System for the Blind in terms of Portability

Portability	Students		Staffs		IT Practitioners		Overall	
	WM	VI	WM	VI	WM	VI	WM	
Weight of the device	3.90	G	3.70	G	4.10	G	3.30	F
Overall size of the device	4.60	G	3.30	F	3.70	G	4.10	G
Overall Mean	4.25	G	3.50	G	3.50	G	3.70	G

Legend: Good(G), Fair(F)

Table 4 shows the evaluation of the respondents to Optical Character Reader of a Braille Unicode System for the Blind on the criteria of portability. Portability table shows that the device meets the needs for portability as the weight of the device scores a 3.90 WM that has a Verbal Interpretation of Good for students, a WM of 3.70 that indicates Good interpretation for the staffs and a WM of 3.10 with an interpretation of Fair for the IT Practitioners. The overall size of the device produced a WM of 4.60 which is Very Good, 3.30 which is Fair and 3.70 WM which is Good for staffs, and IT practitioners respectively. Although the results are not that high the overall WM reach a Good interpretation with a WM of 3.70 so we can conclude that the device portability was met.

f. Weighted Mean (WM) and Verbal Interpretation (VI) of Students and Staffs of ATRIEV, and IT Practitioner for Optical Character Reader of a Braille Unicode System for the Blind in terms of Cost-Effectiveness

Cost-Effectiveness	Students		Staffs		IT Practitioners		Overall	
	WM	VI	WM	VI	WM	VI	WM	
Components Cost	4.50	VG	4.70	VG	4.60	VG	4.60	VG
Housing Cost	4.50	VG	4.90	VG	4.40	VG	4.60	VG
Overall Mean	4.50	VG	4.80	VG	4.50	VG	4.60	VG

Legend: Very Good(VG)

Table 5 shows the evaluation of the respondents to Optical Character Reader of a Braille Unicode System for the Blind on the criteria of portability. Cost-effectiveness table shows that the components cost got a WM of 4.50 and a verbal interpretation of Very Good for students, a WM of 4.70 which is Very Good for staffs, and a WM of 4.60 which indicates a Very Good interpretation for IT practitioners This implies that both the students, staffs and the IT practitioners agreed that the developed device is a cost-effective one. This is very important now that as technology arises, its price also gets bigger.

g. Overall Weighted Mean (WM) and Verbal Interpretation (VI) evaluation for Optical Character Reader of a Braille Unicode System for the Blind

Variables	Students		Staffs		IT Practitioners		Overall	
	WM	VI	WM	VI	WM	VI	WM	
Accuracy	3.77	G	3.77	G	3.90	G	3.83	G
Efficiency	3.85	G	3.90	G	3.95	G	3.90	G
Portability	4.25	G	3.50	G	3.70	G	3.80	G
Cost-Effectiveness	4.50	VG	4.80	VG	4.50	VG	4.60	VG
Overall Mean	4.10	G	4.00	G	4.01	G	4.03	G

Legend: Good(G), Very Good(VG)

Table 6 shows that the overall based on the four variables got a WM of 4.10 and a verbal interpretation of Good for students, a WM of 4.00 which is Good for staffs, and a WM of 4.03 which indicates a Good interpretation for IT practitioners This implies that all the type of respondents agreed that the developed device is effective in term of the variables mentioned.

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h. ANOVA

To determine the difference among the evaluation of Students, Staffs and IT Practitioners of ATRIEVs' assessment of the Optical Character Reader of a Braille Unicode System for the Blind, the analysis of variance or ANOVA is applied. The results of the application of the test statistics will be presented, and discussed below:

Table 7 Summary of Evaluation of the Respondents

Variables	Source of Variation	Sum of Squares	df	Mean Square	F	P	Decision
Accuracy	Between Groups Within Groups Total	0.252 1.013 1.265	2 27 29	0.126 0.038 0.164	3.316	0.052	Accepted
Efficiency	Between Groups Within Groups Total	0.030 0.045 0.075	2 27 28	0.015 0.002 0.017	7.5	0.026	Rejected
Portability	Between Groups Within Groups Total	0.350 0.725 1.075	2 27 29	0.175 0.027 0.202	6.481	0.005	Rejected
Cost-Effectiveness	Between Groups Within Groups Total	0.120 0.040 0.160	2 27 29	0.060 0.002 0.063	30	0.000	Rejected

Table 7 shows that the difference in the evaluation in term of accuracy, efficiency, portability and cost-effective of the Optical Character Reader of a Braille Unicode System for the Blind

1. Accuracy

Table 7 shows that there is no difference in the evaluation of the Students, Staffs, and IT Practitioners in Optical Character Reader of a Braille Unicode System for the Blind between groups and within groups using one-way ANOVA. The computed value of P = 0.052 which is greater than the 0.05 level of significance accepts the null hypothesis. The result of the non-rejection of the null hypothesis indicates the equality of evaluation among the three groups of respondents which further proves that the Optical Character Reader of a Braille Unicode System for the Blind meets the specification and requirements of the respondents in terms of Accuracy

2. Efficiency

Table 7 shows that there is a difference in the evaluation of the Students, Staffs, and IT Practitioners in Optical Character Reader of a Braille Unicode System for the Blind between groups and within groups using one-way ANOVA. The computed value of P = 0.026 which is less than the 0.05 level of significance accepts the null hypothesis. The result of the rejection of the null hypothesis indicates the differences of evaluation among the three groups in terms of efficiency since the users are not knowledgeable in terms of technical operation of the device except the IT Practitioners.

3. Portability

Table 7 shows that there is a difference in the evaluation of the Students, Staffs, and IT Practitioners in Optical Character Reader of a Braille Unicode System for the Blind between groups and within groups using one-way ANOVA. The computed value of P = 0.005 which is greater than the 0.05 level of significance accepts the null hypothesis.

The result of the non-rejection of the null hypothesis indicates the equality of evaluation among the three groups of respondents which further proves that the Optical Character Reader of a Braille Unicode System for the Blind meets the specification and requirements of the respondents in terms of Portability.

4. Cost-effectiveness

Table 7 shows that there is a difference in the evaluation of the Students, Staffs, and IT Practitioners in Optical Character Reader of a Braille Unicode System for the Blind between groups and within groups using one-way ANOVA. The computed value of P = 0 which is less than the 0.05 level of significance accepts the null hypothesis. The result of the rejection of the null hypothesis indicates the differences of evaluation among the three groups of respondents which tells that there is a difference in terms of knowledge or experience in cost among the groups of respondents.

IV. CONCLUSIONS

On the account of the foregoing significant findings the following conclusions were made:

1. The stages undertaken in the development of the Optical Character Reader of a Braille Unicode System for the Blind sign the SDLC followed the system engineering procedure with the steps of Defining Requirements to itemize the specification and needs of target client, Iteration of Integration and Testing for the development, coding, designing, and prototyping until customer satisfaction then Deployment to the client and Maintenance. Those steps will help to provide the highest satisfaction of the users.
2. The result of the assessment of Students, Staffs, and IT Practitioners to the accuracy, efficiency, portability, and cost of the Optical Character Reader of a Braille Unicode System for the Blind is Good therefore recommended for implementation.
3. There is a significant difference in the assessment of the Students, Staffs, and IT Practitioners on the Braille Unicode System using Optical Character Reader for the Blind in terms of efficiency, portability and cost-effectiveness while there is no significant difference in terms of accuracy.
4. Based on the problem encountered during the development of the device, the researchers need to consider all the components by making sure that the criteria that need to meet will satisfy the requirements of the device.
5. The problem encountered was solved by adding functionality similar to the functions the beneficiary uses which they recommended as a solution to the problem.

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Mobile Emergency Response Application Using Geolocation for Command Centers

Jethro B. de Guzman, Ritz Carlo C. de Guzman, and Engr. Remedios G. Ado

***Abstract*—This paper introduces Mobile Emergency Response Application using Geolocation for Command Centers. It is a combination of a mobile and web application for responding to emergency requests for ambulance, fire truck and police by people in a certain area or city. The mobile application would detect user's current location through geolocation and sends to the web application deployed in a command center the name, age, mobile number and location of the user for easily dispatching of emergency units.**

***Index Terms*—Command center, emergency response, geolocation.**

I. Introduction

The actions and responses taken in the initial minutes of an emergency are critical. These life threatening events may happen any moment. Being always prepared and ready can save lives. A call for help to public emergency services that provides full and accurate information will help the dispatcher send the right responders and equipment.

Environmental emergencies are incidents or events that threaten public safety, health, and welfare and include hurricanes, floods, wildfires, industrial plant explosions, chemical spills, acts of terrorism, and others [1]. Emergency response is the organizing, coordinating, and directing of available resources in order to respond to the event and bring the emergency under control. The goal of this coordinated response is to protect public health by minimizing the impact of the event on the community and the environment.

One of the most popular and well known emergency systems in the world is America's 911. The system was designed to provide a universal, easy-to-remember number for people to reach police, fire or emergency medical assistance from any phone in any location, without having to look up specific phone numbers [2]. The technology, regulations and funding that make the system possible are largely based on the technology that existed at the time 911 was first implemented during the late 1960s –i.e., wired phones in residences and businesses.

The Philippines created its version of 911 called PATROL 117. Patrol 117 is the national and official emergency hotline number of the Philippines [3]. It aims to establish an easy recall number that can be accessed by anyone, anytime, anywhere in the Philippines in cases of emergencies, as well as to monitor the efficiency of its responders' network. It however, does not compete with other locally established emergency numbers or with local responders, but complements their local operations.

There are also a number of mobile applications available in smart phones that are beneficial in disaster response [4]. Among these are GPS technology, which can be used in the tracking of rescuers and resources, the translator, which can be used for communication, and the field examiner, which can be used to send information to headquarters for assessment of damages. Indeed, the use of a smart phone in a disaster management system is advantageous.

Command Centers handle certain communities. The release of a smart phone app increases the participation and preparation of the community in certain disasters. Ref. [5] Community-based disaster risk management is a process in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities. Ref. [6] internationally, the trend continues to build capacity in government disaster management capabilities and functions in developing nations and to promote community-based hazard mitigation planning and programs.

The use of new technologies like smart phones and web application play a big role in improving emergency system. Mobile devices have become increasingly important in the developing world, facilitating communication between locals, government officials and first responders [7]. Many applications provide important information in areas of health, agriculture, disaster relief, and crime.

The mass communications media not only quickly notifies the world of disastrous events, but many times their versions are greatly dramatized, if not distorted. In addition, news reports usually do not give specific information about the exact location of a disaster, or details to indicate who has or has not been involved. But with the use of geolocation, the location is plotted on the map and user's information will be sent to the command center [8].

Many of the emergency systems exists are landline-based. With the fast development in technology, especially the emergence of smartphones where almost many people hand carries these devices; we propose a system that would give people an alternative and added option or medium in calling for rescue. Providing the people a mobile application to be installed on their smart phones to send emergency requests and a web application to be deployed on command centers to receive and locate the mobile app users, this might be useful for easy and fast dispatching of emergency units.

II. Proposed System

A. Technologies Involved

The core concept of the researchers focuses on a mobile

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and a web application. Our major goal is to provide information such as name, age, type of emergency response needed and location of a person using the mobile app and to be retrieved by a system on the web and plotting the equivalent latitude and longitude on a Google map in order to pinpoint the exact location of the person who uses the mobile app. To achieve it, the researchers also studied an extensive array of technologies focusing on computer engineering field.

For the mobile application, the researchers plan to use Phonegap instead of a native android language in order to maximize the user interface and to make it flexible and easy for other mobile platforms to adopt. Phonegap is a free and open source framework that allows you to create mobile apps using standardized web APIs for different mobile platforms. Basically it uses HTML, CSS and JavaScript, and wraps it with phonegap then deploy to different mobile operating systems like Android, iOS, Windows, Windows 8, Tizen, Blackberry, Blackberry 10.

QuoJS will be used as the main JavaScript Library for the mobile application. It is a micro, modular, Object-Oriented and concise JavaScript Library that simplifies HTML document traversing, event handling, and Ajax interactions for rapid mobile web development. It allows writing powerful, flexible and cross-browser code with its elegant, well documented and micro coherent API.

For getting the user's location, it requires to have a stable internet connection and an enabled GPS for more accurate reading of latitude and longitude points. Google Maps JavaScript API will be used to read user's geolocation. Reverse geocoding will also takes place in order to convert the geographic coordinates and display a human readable address to the user.

Since the researchers will focus more on running the mobile app on an android platform, Fries framework will be used. It is a mobile UI development framework that creates a native android-like feel using HTML, CSS and JavaScript.

For the web application, the researchers intend to use SailsJs. It is a MVC Framework for Node.js. Node.js is a platform built on Chrome's JavaScript runtime for easily building fast, scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices. We will also use Socket.io. Socket.IO aims to make real-time apps possible in every browser and mobile device, blurring the differences between the different transport mechanisms. It's care-free real-time 100% in JavaScript.

Tuktuk is the main UI framework for the web app. It is simple and a Responsive Web Design framework for creating websites and web applications. It contains HTML and CSS-based design templates for typography, forms, buttons, navigation and other interface components.

All the data will be stored on a MongoDB database. It is a NoSql and a document database that provides high performance, high availability, and easy scalability.

B. System Architecture

In the initialization of the mobile application, it detects the current position of the user through geolocation. The user can navigate in three tabs namely home, info and hotlines. The home tab contains the current location of the user. It is displayed on the map. Geographical points are converted into human-readable address. Three emergency buttons are present: ambulance, police and fire truck. The info tab contains details like name, age and mobile number of the user. He/She needs to input once and data will be save but he/she can edit if necessary. The hotlines tab contains other emergency hotlines. Since the application is internet dependent because of the geolocation, the emergency numbers are pre dialled enabling the user to call for emergency even without an internet. The system architecture for the mobile application is designed as described in Fig. 1.

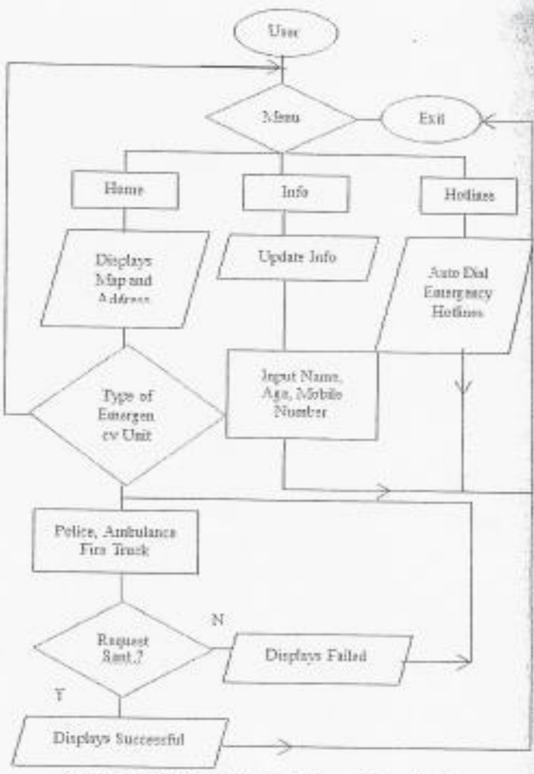

Fig. 1. System Architecture of the mobile application.

For the web application, the dashboard contains a map and a side bar where emergency reports are appended real time. The user can respond, decline and view the report on the map. The system architecture for the mobile application is designed as described in Fig. 2.

C. Graphical User Interface

The researchers provide graphical user interfaces for both mobile and web application where the users can interact with the emergency response system. Fig. 3 shows the prototype of the home tab of the mobile application where the users can select emergency request for ambulance, police and fire truck.

Fig. 4 shows the prototype of the info tab of the mobile application where the users can update their personal information that will be send to the command center.

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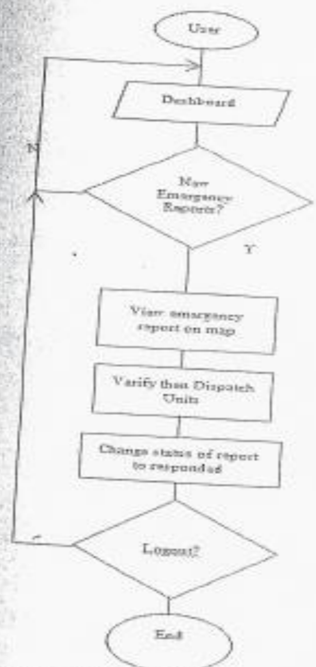

Fig. 2. System architecture of the web application.

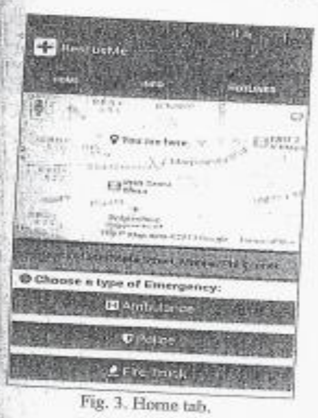

Fig. 3. Home tab.

Fig. 4. Info tab.

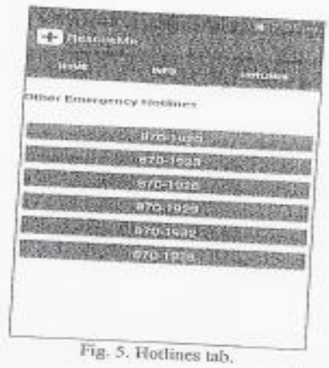

Fig. 5. Hotlines tab.

Fig. 5 shows the prototype of the hotlines tab of the mobile application where it contains pre dialled hotline numbers that can be used when the application is not connected in the internet.

Fig. 6 shows the prototype of the dashboard of the web application where it retrieves the sent emergency request and plot on the map the location from the mobile app user.

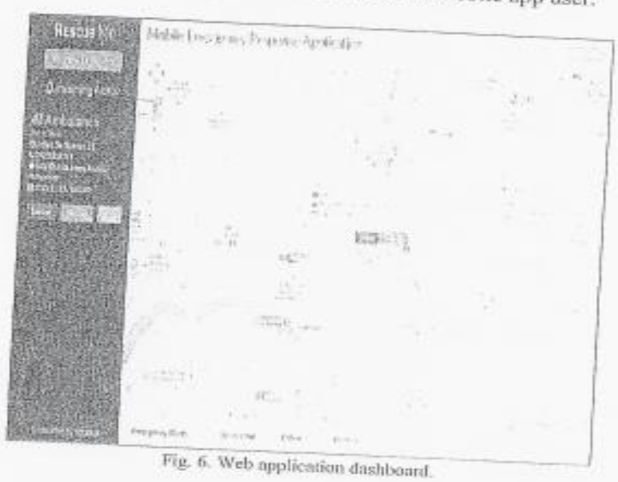

Fig. 6. Web application dashboard.

III. Scope and Limitation

The study is mainly focused on the development of a mobile emergency application for the community and a web application for Command Centers.

The mobile application can only run on devices particularly smart phones that run on an Android Operating System version 2.3 Gingerbread or Higher for the meantime. But the app can be ported to other platform since it will be created using Phonegap. While the web application, it can be accessed through the internet.

The mobile app can be downloaded by the community from a webpage where the web application is also hosted. The application basically would detect the user's current location. The user needs to fill up some personal information for verification, such as name, age and mobile number. The application is only limited into three emergency units such as ambulance, police and fire truck.

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Once the user click to request a certain emergency unit, the application automatically send the user's geographical points using the phone's GPS together with the personal information. The Command Center's web application will retrieve the sent distress request from the mobile app and plot it in Google Maps real-time.

Since the mobile app needs to track the location of the user, it requires a stable internet connection. Without it, the application won't be able to send an emergency request. Because the application would rely to the IP address provided by the internet connection to locate the current position of the user in the map. The accuracy of the position's detection of the user also depend on the place and how stable the user's internet connectivity. The error of the GPS position is mainly determined by the interaction of the time varying constellation of the satellites and the built-up in the close vicinity [9]. The average position error ranges from 2 meters on an open square to 15 meters even in wide streets with four story houses on both sides. The built-up shades the satellites especially suitable for a positioning. The constellation of the satellites is periodic and the built-up constant, therefore a rudimentary database was used to reduce the positioning error by ~10%. We will also provide auto dialled links for other emergency hotlines in case the user won't have a chance to connect to the internet.

The mobile app cannot support location tracking for users on a moving vehicle. The app detects the last position of the user on the map, and that is the location to be sent to the command center.

IV. Conclusions

In this paper, we proposed the use of mobile and web technologies to add another option and medium for emergency response. The proposed method used the current trends in mobile and web technologies for fast and efficient dispatching of emergency units

Our goal is not to create a new protocol in emergency response, we have just maximize the use of smart phones to act as medium and to help people save their lives in case of disaster. Command centers will also benefit in a way that the location of the user are easily detected and plotted on a map.

Our porposed system supposed to lessen the response time it takes to respond to emergency events. It also provides reliable information that might help in identifying accidents.

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