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Android-Based Speed Limit Detector with SMS Support: Its Applicability and Usability to Traffic Management Unit

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ABSTRACT

The road traffic accidents are becoming alarming in the Philippines. The number of fatalities increasing day by day is a real challenge for all concerned agencies to prevent it. This study aimed to develop an Arduino-Based Speed Limit Detector that will buzz motorcycle drivers exceeding a speed limit of 60 kilometers per hour. The system will automatically send SMS to the nearest Traffic Management Unit in order to reprimand drivers violating the policy. The study also determined the applicability and usability of the system to the Traffic Management Unit of Sagay City, Negros Occidental. The researcher used Rapid Prototyping method to develop and test the system according to its usability, applicability, and effeciency. As to efficiency, the system earned 4.56 from the IT experts which was interpreted Very Good. As to its usability, the Traffic Management Unit of Sagay City rated the system with 4.50 interpreted as Very Good while the overall applicability of the system was rated 4.36 interpreted as Very Good.

KEYWORDS: *Arduino, Magnetic Switch, Speed Limit Detector, Traffic Accident*

INTRODUCTION

A road accident is commonly attributed to the collision of vehicles, pedestrian, or with an object that will result to death, disability and damage to property. Road accidents were caused by driver's errors, mechanical defect, over speeding, drinking spree before driving, and damaged roads. As of April 2018, the Cebuana Lhuillier news and events highlighted the top ten (10) causes of car accidents in the Philippines. On the list, overspeeding was recorded among the top three (3) reasons why vehicular accidents happen. This study aimed to develop a system that will help the Traffic Management Unit of Sagay City to monitor the motorcycle drivers who exceed the prescribed speed limit of sixty (60) km/h. This study also determined the applicability, usability, and efficiency of the system in terms of its function and purpose. This study took place in Sagay City wherein a vehicular collision which took four (3) lives and injured the other five (5) happened before the year 2017 closed.

RELATED STUDIES

Motorcycle Speed Control System

The device consisted of a modified capacitor discharge ignition (CDI) that was responsible for the speed limit and a transmitter and receiver module for the helmet detection. This study sought to address the following issues: (a) the immediate response of the device and (b) its durability when the accident occurs.

Experimental development and descriptive approaches were the methods used. Fifteen purposively chosen evaluators were requested to assess the speed control system.

Findings revealed that the device was effective to limit the speed of a certain motorcycle model and was satisfactory in automation and operation.

Public Utility Bus (PUB) Security Monitoring Systemwith Locatorand Speed-Limit Tracker via GPS Technologywith SMS Notification

Given the high rate of crimes and accidents in the country, the researchers considered developing a monitoring system that could allow passengers and commuters to have a safe travel in buses. With the use of different technological advancements, the system could lessen the incidents of crimes and accidents.

Speed Track

This study aimed to create a device which could determine the speed of the vehicle and check for over speeding. The study sought to address the problem of car accidents in highways.

Experimental development and descriptive approaches were the methods used. Fifteen purposively chosen evaluators were requested to assess the speed track control system.

Findings revealed that the device was effective to limit the speed of a certain road machine model and was satisfactory in automation and operation which could prevent road accidents[4].

METHODOLOGY

This study used descriptive-developmental method to meet the desired objectives.

System Design

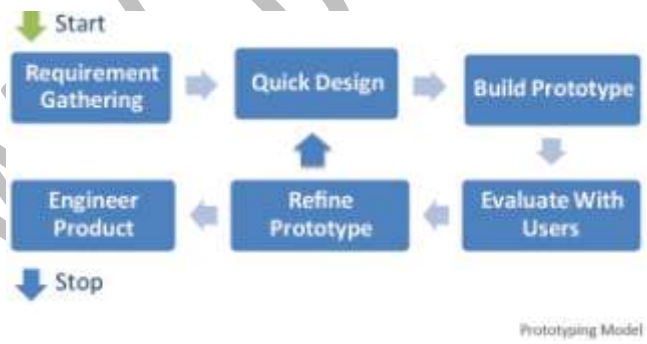

Figure 1. Rapid Prototyping Model

Rapid prototyping is the act of creating a low-fidelity object for the purpose of testing a concept. Through rapid prototyping, a designer is able to quickly test and adapt a design with minimum investment in time and the cost of failure.During solution design, Rapid Prototyping allows for concept testing, accelerating the innovation process.

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How the System Works

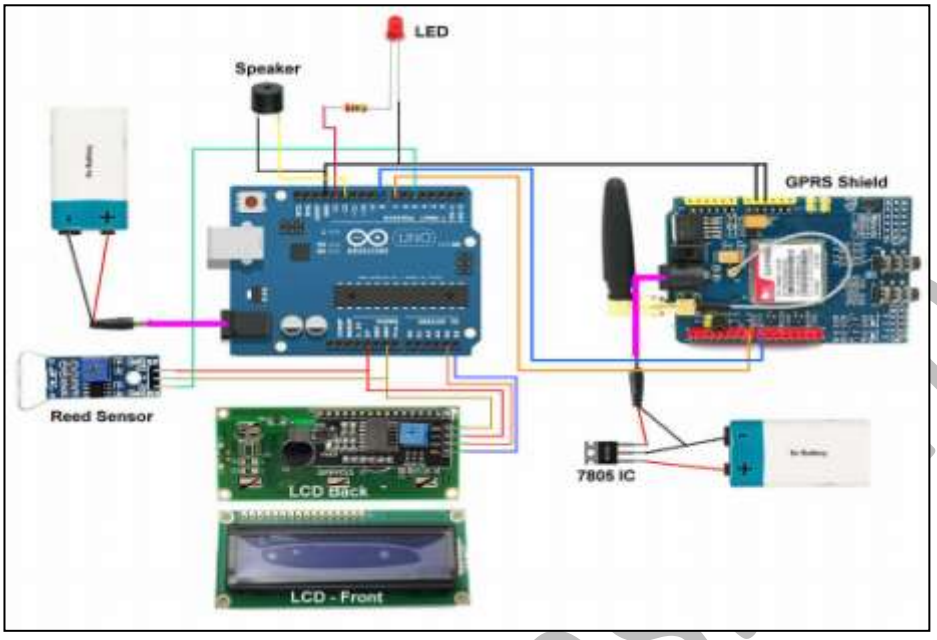

Figure 2. Technical Requirements of the System

After the prototype was developed, it was evaluated by three (3) IT experts using the criteria in Mc Calls Software Quality Model. The system was also tested by a group of motorcycle drivers in Barangay Old Sagay and the Traffic Management Unit of the Philippine National Police Sagay City station.

Figure 3. The Android-Based Speed Limit Detector with SMS Support Prototype

Figure 3 shows the picture of the developed prototype. Once exceeding the speed limit of 60km/h, the device will alarm and red LED will blink to call the attention of the driver. It will then send SMS report to the Traffic Management Unit.

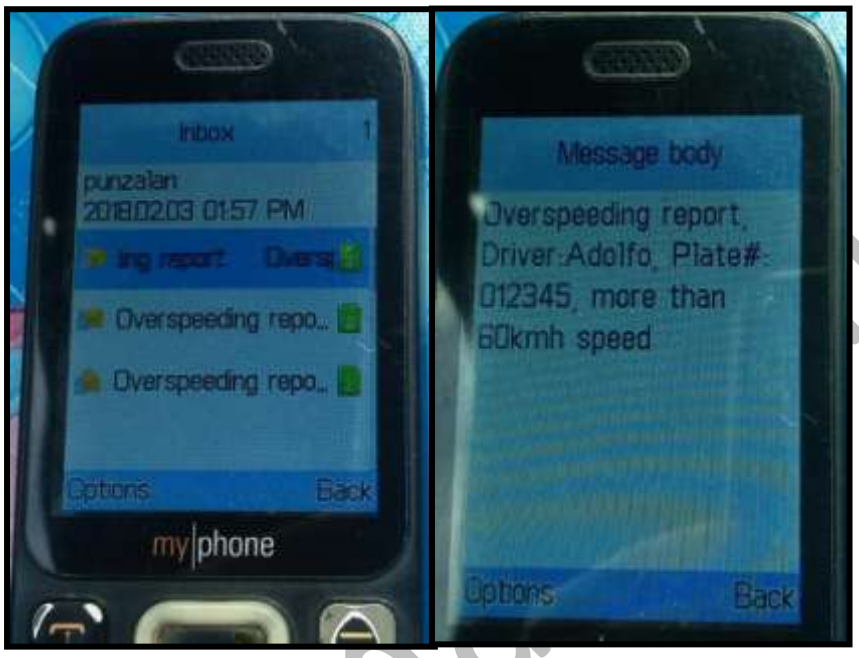

Figure 4. SMS sent to the nearest Traffic Management Unit

Once a driver exceeds 60km/h speed-limit, it will automatically send SMS about an overspeeding report containing the driver's name and the plate number of the vehicle. Thus, making it easier for the Traffic Officers to reprimand this kind of drivers.

Data Analysis Procedures

The researcher gathered and collected the data in order to tabulate its statistical interpretation. The mean was used to determine software quality, efficiency, and user satisfaction.

RESULTS AND DISCUSSION

After the series of tests and detailed evaluation of the system, the results are as follows:

Table 1.The Quality of the Developed System in terms of its Usability

Criterion	Experts			Mean	Interpretation
	1	2	3		
Operability	5	4	5	4.67	Very Good
Training	5	4	4	4.33	Very Good
Grand Mean				**4.50**	**Very Good**

Legend: 4.21 – 5.00 Very Good, 3.41 – 4.20 Good, 2.61 – 3.40 Average, 1.81 – 2.60 Poor, 1.00 – 1.80 Very Poor

Table 2.The Quality of the Developed System in terms of its Effeciency

Criterion	Experts			Mean	Interpretation
	1	2	3		
Conciseness	4	4	4	4.00	Good
Execution-Efficiency	5	5	5	5.00	Very Good
Operability	5	4	5	4.67	Very Good
Grand Mean				**4.56**	**Very Good**

Legend: 4.21 – 5.00 Very Good, 3.41 – 4.20 Good, 2.61 – 3.40 Average, 1.81 – 2.60 Poor, 1.00 – 1.80 Very Poor

Table 3.The Quality of the Developed System in terms of its Applicability as Rated by the Traffic Management Unit

Criteria	Mean	Interpretation
1. The system can detect overspeeding motorcycle.	4.5	Good
2. The system is able to send sms to traffic officers after speed exceeds 60mph.	4.6	Very Good
3. SMS is readable in the LCD Screed of the device.	4.7	Very Good
4. The system can genrate report of driver's violation.	4.0	Good
5. Overall, the system is applicable for implementing and monitoring of traffic rules and policies of the Traffic Management Unit of Sagay City.	4.0	Good
Grand Mean	**4.36**	**Very Good**

Legend: 4.21 – 5.00 Very Good, 3.41 – 4.20 Good, 2.61 – 3.40 Average, 1.81 – 2.60 Poor, 1.00 – 1.80 Very Poor

Tables 1-3 showed the usability, efficiency, and applicability of the developed system for the Traffic Management Unit of Sagay City. These were proven with the remarkable satisfaction ratings given by the experts and the Traffic Management Officers.

CONCLUSION

The developed system is very applicable in terms of traffic rules and regulation management. It has a user-friendly and usable interface that can help the traffic authorities to monitor the tricycle drivers who exceed the 60km/h speed limit. This system will also lessen the cases and incidents of vehicular collisions and road accidents due to overspeeding.

RECOMMENDATIONS

On the basis of the conclusion, the following recommendations are the following:

1. The Sangguniang Panglungsod (law-making body) of Sagay City may consider creating an ordinance for the commercialization and implementation of the developed system.

2. That further study may be conducted to improve the architecture and design of the developed prototype.

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