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Motorcycle Anti-theft Alarm and Tracker system with Accident Notifier and Engine Controller Device using Smartphone

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ABSTRACT: Motorcycle is one of the in-demand types of transportation in the Philippines. It helps the people reached the desired location instantly. But motorcycles are prone to motorcycle theft because of its physical size. As the number of motorcycle increases, the number of motorcycle theft is also increasing. It is difficult for motorcycle users to recover their stolen motorcycle. In tracking stolen motorcycle, the owner needs the help of the authority to recover it and it involves lots of people and manpower. The study aimed to design aAndroid-based device that has (1) an anti-theft alarm to notify the owner if someone attempts to steal his motorcycle, (2) a device that will be equipped with a GPS module to track stolen motorcycle easily, (3) device that is capable of sending an SMS message to emergency personnel if an accident happens, (4) device that enables the user to turn on/off the ignition of their motorcycle with just one tap on their smartphone, (5) a system that will help the motorcycle owner to secure the motorcycle and to prevent motorcycle accident caused by drunk driving, and (6) device that will ensure that the user wore the helmet properly. Thus the device will ensure the safety of the driver and motorcycle from accident and motorcycle theft and will shorten the tracking time a stolen motorcycle.

KEYWORDS: *Engine Controller, Anti-theft, Motor napping, Accident Notifier, Android-based*

1.0 INTRODUCTION

Motorcycles are the common target of thieves because of their abundance and sudden rise in number. In 2015, more than 3,000 motorcycles have been stolen from January to March alone. Every week, An Average of 21 motorcycles is stolen in Metro Manila

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alone [1][2]. To give a solution to this growing problem, Researchers attempt to create different devices to reduce the growing number of motor napping. There are different kinds of anti-theft devices in the market and many types of research about it. In Motorcycle Anti-theft system (mats) research, the device uses a vibrator sensor to detect if someone is trying to steal a motorcycle that is equipped with this device [3][4].

In Motorcycle Location Tracker for Android research, the device requires using GPS and a strong internet connection to accurately track motorcycle using GPS module and a module to connect to the internet, that way it will be easy to track a stolen motorcycle [5].

Another related project is entitled Motorcycle GPS Tracker. It is a waterproof device, has an anti-tamper feature that alerts the owner of the motorcycle if someone tries to disable or remove the GPS Tracker and has engine immobilizer so you can turn on/off the engine with a text from your cell phone – perfect for theft prevention. It also has a built-in shock/motion alarm that will alert you if someone tries to move or roll your motorcycle [6]. An anti-theft device makes it more difficult for thieves to drive someone's motorcycle and will immediately notify the motorcycle owner if someone tries to start or move his/her motorcycle.

The main objective of this study is to design an android-based anti-theft and tracker system with accident notifier and engine controller device fora motorcycle that can perform different tasks, unlike other existing devices.Other specific objectives are:

i. To create a theft notifier for motorcycle.
ii. To create a device that will detect if the user is under the influence of alcohol.
iii. To create an accident notifier device.
iv. To create a device that will continuously monitor the location of the motorcycle and report the status of the vehicle.
v. To develop an android application for anti-theft alarm and tracker device for motorcycle.

The device is a combination of all the existing devices that perform different task like tracking, location checking, notifying emergency personnel, notifying the user if someone attempts to move or roll his/her motorcycle and the device has a user-friendly android application so the user can communicate easily with the device. The android application helps the user in sending commands and requests to the device by just tapping buttons on the screen.The device will be also capable of preventing the user from driving the motorcycle if he/she is under the influence of alcohol or the helmet is not properly worn because of the alcohol detector and object sensor that will be installed in the helmet.

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2.0 METHODOLOGY

The researcher aims to develop a Motorcycle Anti-Theft Alarm and Tracker System with Accident Notifier and Engine Controller Device using Smart Phone with different electronic devices. First, the Arduino will process every information coming from every module connected to it to give a good output through the Arduino relay and buzzer. Second, the GSM Module, this is used to send an SMS message to notify the user about the motorcycle location and to give an emergency alert. Third, the GPS module, this is used to identify the latitude and longitude of the motorcycle. Last, the accelerometer is used to measure the angle and speed of the motorcycle. This four electronic device was the main electronic component needed in creating the project.

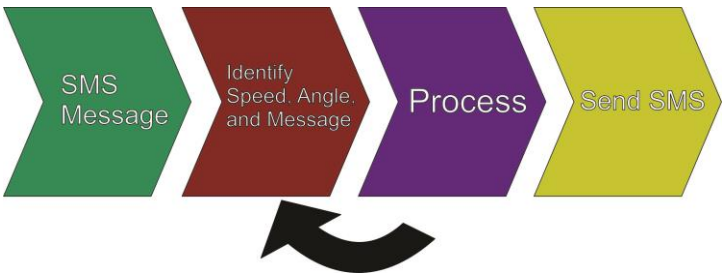

Figure1:Conceptual Diagram

The figure shows the Conceptual Framework of the Motorcycle Anti-theft and Tracker system with Accident Notifier and Engine Controller Device using a Smartphone. An SMS message coming from the user will be received by the device. The device will accept it as an input and will analyze it if the user is asking for a location check or the user wants to turn on and off the engine of the motorcycle. After analyzing the message, the device will send an SMS based on the message from the user's phone.

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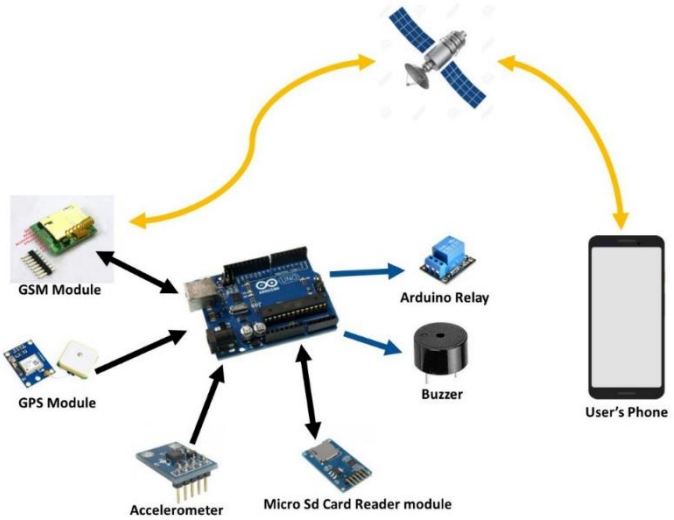

Figure2:Block Diagram

The Conceptual Diagram shows the setup of the system and the flow of connection and sending of information from the Arduino to the modules to the user's phone. Micro SD Card Reader module will store every information of the user and the motorcycle. The information about the motorcycle will be sent through SMS message from the device to the user's phone Using the GPS module, the device will be able to identify its current location and send it to the owner through SMS message using the GSM module [9]. The device will be able to send a message to the user and also receive a message from the user. The Arduino will process that message, if the user message is to check the current location of the vehicle, the device will send the current location of the vehicle, or if the user wants to turn OFF the engine of the vehicle, the Arduino will send a request to the Arduino relay to turn OFF the vehicle Engine. If someone attempts to steal the motorcycle, the accelerometer will sense it and send a request to the Arduino to notify the user by sending a message using the GSM module. The buzzer will be energized if an attempt occur. If the device is moved away from its parking area, the device will send a message to the user and automatically turn off the engine of the motorcycle.

The android application will be developed using Unity, a cross-platform game engine application for developing computer applications, android applications, and IOS applications [8] [10].In able to create the Anti-Theft and Tracker Device for Motorcycle with Accident and Location Notifier there are some components that are needed.

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Figure3:Arduino Mega 2560 R3

Figure 3 shows the Arduino, An open-source electronics platform usually used for prototyping. The Arduino will be the brain of the device it will process every information coming from every module connected to it to give a good output through Arduino relay and buzzer

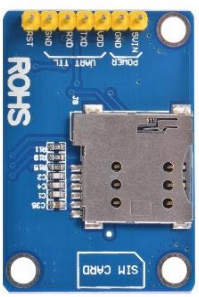

Figure4:QuadBand GPRS-GSM SIM800l

Figure 4 Shows the GSM module for Arduino will be used to send an SMS message to notify the user of the motorcycle location and to notify emergency personnel if an accident happens. This module is connected to the Arduino to get the contact number of the user or emergency personnel, GPS location of the motorcycle and the message content that will be sent to the user.

Figure 5Ublox NEO-6M GPS Module

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Figure 5 shows the GPS Module that will be used to track the location of the motorcycle. Using GPS Module, the device will be able to identify the current location of the motorcycle by defining its latitude and longitude. This device is connected to the Arduino to give accurate information on the latitude and longitude of the motorcycle.

Figure 6SparkFun ADXL335-Triple Axis Accelerometer Breakdown

Figure 6 Shows the Accelerometer that will be used in the project. This Device will measure the angle and the speed of the motorcycle through this the movement speed of the motorcycle will be identified.

Figure 7Relay Module 4-Channel

Figure 7 shows the Relay Module which will be connected to the Arduino. Using this module, the engine ignition will be controlled using the relay's contacts. One of the relay contacts will be connected to the starter of the motorcycle to be able to start and kill the vehicle engine.

Figure 8SparkFun Level Shifting microSD Breakdown

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Figure 8 shows the microSD card reader module for the Arduino to be able to store and save data and information in an SD Card.

3.0 RESULTS AND DISCUSSION

Arduino will be the brain of the system. The GPS module is connected to the Arduino. It will define the location of the motorcycle derived from the latitude and longitude. The accelerometer will monitor the angle and the movement speed of the motorcycle. This information will be sent to the user using the GSM module. Using the User's phone, the ignition of the motorcycle can be stopped using an application in the Android phone. The information will be sent from the phone to the device and the Arduino will process that information and send it to the Arduino relay to kill the ignition.

The schematic diagram of the device is shown in figure 9.

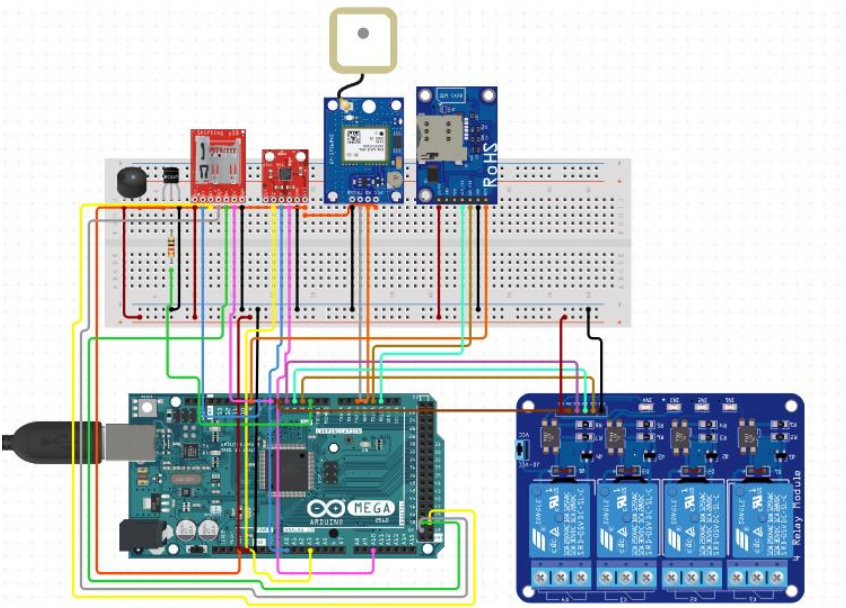

Figure 9Schematic Diagram

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The design of the User interface is shown below.

Figure 10Information Setting Display

Figure 10 shows how user information and motorcycle information will be accumulated. After the installation of the application, the information setting display will appear to accumulate information about the user like the user name and user contact number and will get the contact number of the device that is installed on the motorcycle. This information will be sent to the device to save it to the device's memory. This way the device will access the information immediately in a non-safe state or emergency state

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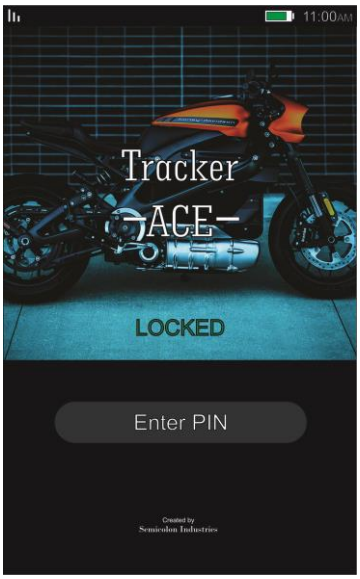

Figure 11User Confirmation Display

Figure 11 shows the user confirmation display. The application will ask for a pin.

Figure 12Main Screen

In Figure 12, the user will find the message text box, engine immobilizer button and a button to check the location of the motorcycle.

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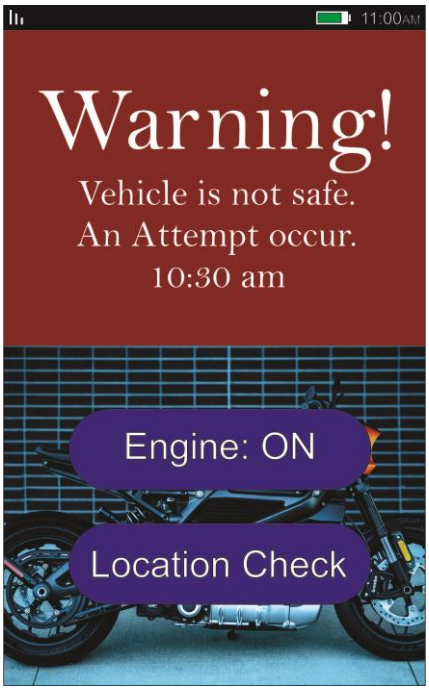

Figure 13Main Screen

Figure 13 shows the main screen with a warning message on the message text box. If someone

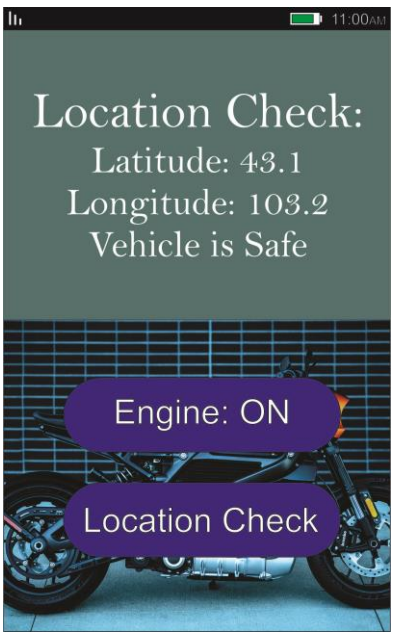

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Figure 14Main Screen

Figure 14 shows the main screen with information about the motorcycle's status.

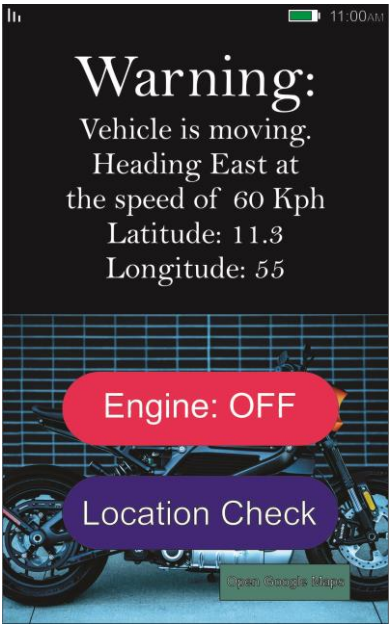

Figure 15Main Screen

Figure 15 shows the main screen with a warning message on the message text box which.

4.0 CONCLUSION

Motorcycle Anti-Theft Alarm and Tracker System with Accident Notifier and Engine Controller Device using Smart Phone is a device that can notify the motorcycle user when someone is attempting to steal their motorcycle also using this device the location of the stolen motorcycle will be identified easily. This device is communicating to the user's phone for an efficient way of identifying the status of the motorcycle.

5.0 RECOMMENDATION

The Group would like to recommend the future researchers of the same topic to design a transmitter and receiver device to make the communication between the device and smartphone efficient.

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