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Developing Android-Based Motorcycle Smart Lock Application System and Location Monitoring

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Abstract. Current technological developments have included in the field of motorcycles. Currently, a GPS Tracker system has been developed that can monitor the location of the motorcycle and control the engine on the motorcycle remotely. This gave rise to the idea of building a motorcycle smart lock system using an Android-based Arduino with GPRS-based transmission media. The purpose of this system is to design a system so that it can control motorcycle engines, monitor motorcycle locations, view motorcycle travel history and provide information on nearby locations such as the location of police stations, hospitals, restaurants, gas stations and ATMs through the android application. The characteristics analyzed in this system is the functional testing of the system. From the results of the tests carried out, it can be concluded that the android application has been running well and is more informative, the communication system for the android application to the hardware cannot be applied in all places but in places that have good signal coverage. The worse the signal condition, the more commands the android application makes to the hardware, the greater the delay generated.

Keyword: Smart Lock, GPS Tracker, Motorcycle, Application, Google Maps

INTRODUCTION

The development of technology is currently very rapid with the increasing number of motorcycle owners, the vehicle security system has become a major requirement for vehicle owners [1, 2]. Security such as vehicle alarms that are widely offered and used are those that use sound as an indicator which is a standard facility of an alarm, this alarm is only capable of sounding a loud sound through a loudspeaker installed on the vehicle to provide information to the owner or the environment around the vehicle that the alarm is active [1, 3, 4]. With the rapid interest of vehicle owners about the safety of their vehicle systems, lately there are many GPS tracking module products [5, 6]. However, this GPS Tracking product is still not optimal because there is no display of its own application because it still uses sending commands via Short Message Service (SMS), even though in this era SMS is rarely used because it has switched to internet data. Conditions like this are deemed less effective for vehicle owners if the system the control is still using SMS, so we need a system that can monitor and control the presence of the vehicle with an android application that can be directly connected to the GPS Tracking module [7, 8]. Based on this problem, in addition to a loudspeaker as an indicator, it is also necessary to have a sending medium that has a wide enough range as an indicator to provide information to vehicle owners, and prevent the vehicle's engine from starting. So, to meet these needs, it can be achieved by using basic techniques on the existing alarm system, namely by producing a loud sound, then utilizing Internet of Things (IoT) technology so that it is connected to Android [9], as well as securing the operation of the machine by turning off the machine [10].

According to previous research references [5], have conducted a study with a GPS tracker system mounted on an object placed in a predetermined place. Then the GPS data from the device will be retrieved remotely using Short Message Service (SMS) from a cell phone. To make a data request on the device must use a predefined code. The purpose of this research is to build a system capable of producing a reliable and accurate GPS monitoring system. So that it can produce useful tools for the community [11, 12]. Then, [13] has designed a car security system to turn off and turn on the engine and can find out the location of the car via Short Message Service (SMS). The Short Message Service (SMS) used has a certain code to carry out the data retrieval command. For communication, the ITEAD SIM900 GPRS/GSM module is needed. From the incoming SMS code, it will be processed by the Maple LeafLabs ARM Cortex M-3 microcontroller to activate the relay as a car contact switch. Meanwhile, the location of the car is obtained from the SkyLAB SKM53 GPS data which will later be sent to the user via SMS. Another research from [14] in implementing a mobile tracking and security system, by utilizing a Global Position System (GPS) technology that is integrated with the Global System for Mobile Communication (GSM) microcontroller, internet, and database. the output is generated in this study that can be used for tracking and monitoring vehicles with a fast and accurate digital map display, and can control turning off and turning on the vehicle engine via Short Message Service (SMS) remotely, so that it can be a solution for efficient vehicle security monitoring [15].

The novelty of the Motorcycle Smart Lock System Using an Android-Based Arduino from the results of previous research is a system designed to be able to help users turn on and turn off motorcycle engines remotely through an android application, can monitor motorcycle locations and motorcycle trip history in real time. with a visual map through the android application and can provide information on the distribution of nearby locations such as the location of gas stations, ATMs, police stations and nearby hospitals that can help users get information if something unexpected happens such as running out of fuel, a crime or an accident occurs while in the area. on the road

MATERIALS AND METHODS

The materials used in this research consist of hardware and software. Needs analysis is used to find out and compare the knowledge obtained during field studies with literature materials related to GPS based Location Tracker, and determine the needs that must exist in the system. The necessary data and information were obtained from various related sources to provide complete input for the development of this system.

Materials

The materials used in this study are hardware that will be used as a design for a Motorcycle Smart Lock System Using an Android-Based Arduino, such as an Intel Core i5-2520M CPU @ 2.40 GHz x 2, 8 GB DDR3 RAM, 232.2 GB hard disk, monitor 14 inches, 1280 x 800 pixels, Intel Corporation 2nd Generation Core Processor Family Integrated Graphics Controller Graphics Card, and standard mouse and keyboard devices. The software used is Linux Mint 12 Cinamon 64-bit Operating System, HTML, CSS, and Javascript as Front-end system language, PHP as Back-end API, Mysql, Ionic Framework, AngularJs, Yii Framework, NodeJs, Android Studio, Document Editor Sublime Text, Adobe Photoshop CS3, android device with minimum specification Android 4.0 Operating System. The research material here is in the form of knowledge as the foundation for this research. It comes from Study Reviews of previous research journals in the form of e-books, journals, and books related to research and in particular related to the development of the Android GPS based location tracker platform software.

Methods

The data collection method in this study was carried out in order to obtain data to be analyzed and processed, so that it was found what problems exist and it is hoped that this research can produce solutions to these problems. The methods used in data collection include interviews, literature study, needs analysis and system design analysis.

System Design

This motorcycle smart lock system uses Internet of Things (IOT) technology where for communication between hardware and the system uses the Application Programming Interface (API) Service for interpreting communication between the client and the server, to support smooth communication, internet is needed in the communication process.

In Figure 1, the Block Diagram of the system presented above consists of the main components, namely Arduino as a motorcycle smart lock system module where this module is used to send motorcycle coordinate location data to the database and control motorcycle engines, to support the operation of the module, it is necessary an android-based connecting application so that users can be more flexible in monitoring the location and controlling the motorcycle.

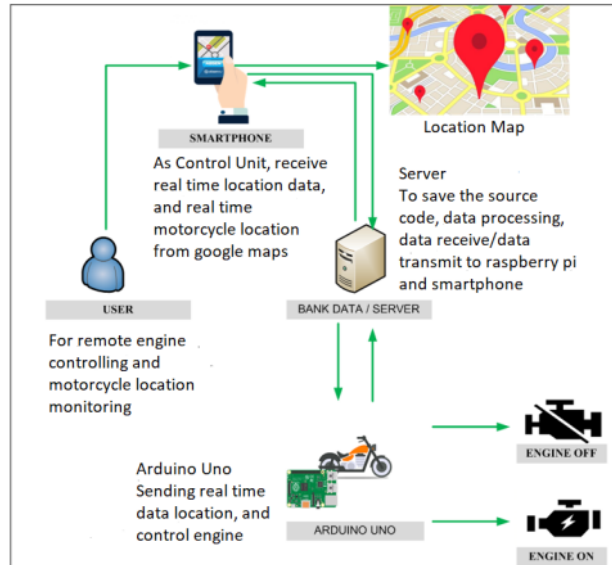


FIGURE 1. System Block Diagram

The system flowchart in Figure 2 describes an overview of the working bicycle smart lock system where to use this system the user must have an android application for a motorcycle smart lock system and a motorcycle smart lock system hardware.

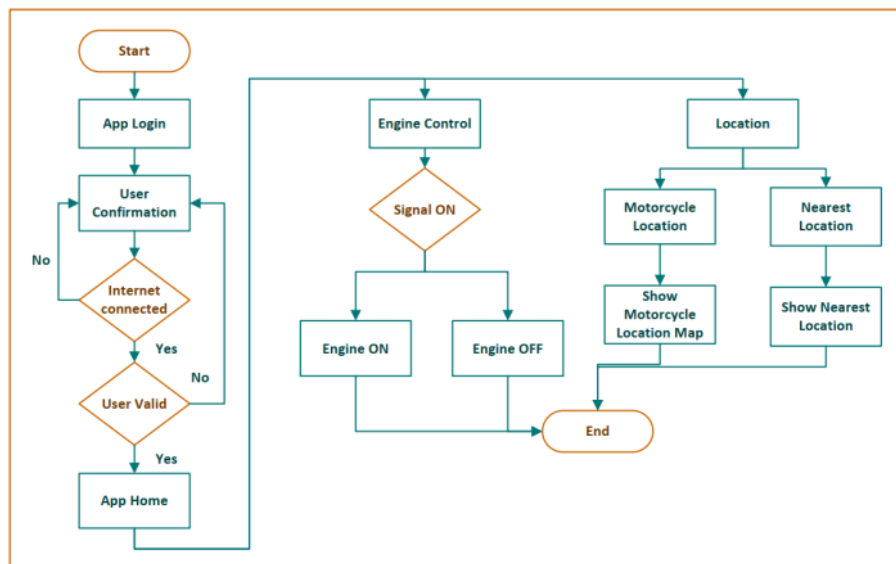


FIGURE 2. Design System Flowchart

To run the motorcycle smart lock system, the user is required to have an account to log into the android system and must be connected to the internet, if the user has successfully logged in, the main display of the application will be presented with brief information about the vehicle profile connected to the hardware, engine condition status, digital clock, and there is a main menu, namely the engine menu and the location menu

In this engine menu, it functions as a menu to control the motorcycle engine either to turn on or turn off the engine, then for this location menu there are 2 (two) sub menus, namely the motorcycle location menu and the nearest location menu, for this motorcycle location menu it is used for monitoring motorbikes at any time with visual maps, while the nearest location menu is used to help users find the nearest location such as ATMs, gas stations, police stations and hospitals with visual maps.

RESULTS AND DISCUSSION

The implementation of the Internet of Things in the smart lock system for motorcycles with an Android-based arduino is to use an Arduino Uno microcontroller and a SIM808 GPS module as hardware in its design, which functions to send the coordinates of the motorcycle's location to the database and control the motorcycle engine. The Arduino Uno and the SIM808 GPS Module communicate via serial software by connecting the Rx Tx serial pin between the Arduino and the SIM808 GPS Module, as presented in Figure 3.

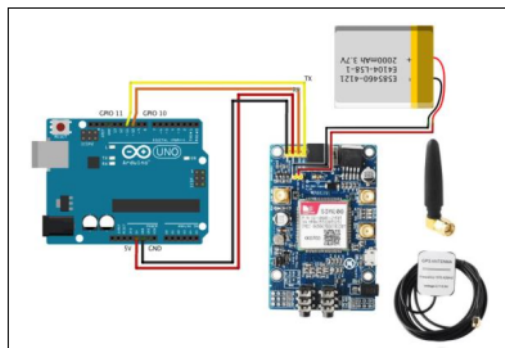


FIGURE 3. Hardware System Design

The interface design is presented in Figure 4 below. The Login App is designed for system security purposes, to enter the system the user is required to have an application username and password, and provides a forgot password feature to reset the password.

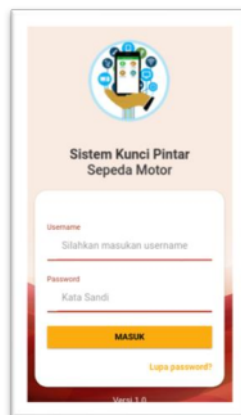


FIGURE 4. Login App Design

The Forgot Password form is used to facilitate the user if he forgets his password to enter the application, where this form the user is required to enter the username, email and nick that has been registered in the application, the email on the form is used to send the login password to the application so that the user can have re-access to enter the application. This display is the home application display after a successful login, which contains information on the motor type, engine status, and clock, besides that there is also an engine menu and a location where this engine menu is used to turn off and tum on the motorcycle engine remotely like a remote control, then the location menu is used to monitor the location of motorcycle vehicles in real time with a visual map, on the footer there is also a tabs menu containing the home menu, alarm and logout, as shown in Figure 5.

Possessive (ETS)

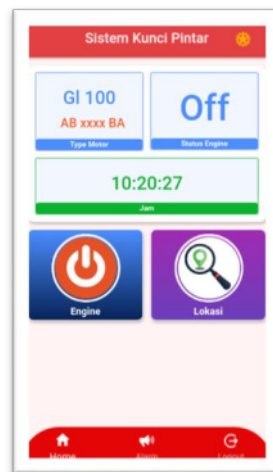


FIGURE 5. Home Application Display

The display in Figure 6 will appear when the user presses the engine button, the system will provide a notification that provides a statement whether the user will turn on the motorcycle engine, if the user selects "Yes" then the system will continue the command to the installed hardware to connect the motorcycle's electrical flow so that the motorcycle engine can be started.

Run-on (ETS)

Sp. (ETS)

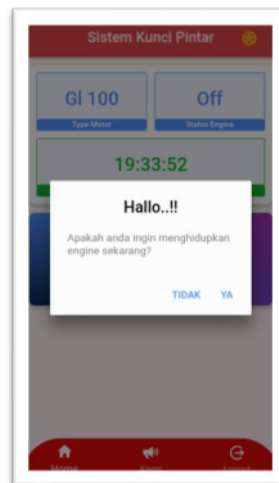


FIGURE 6. Motorcycle Start Engine

In addition, a display will appear if the user presses the engine button, the system will provide a notification that provides a statement whether the user will turn off the motorcycle engine, if the user selects "Yes" then the system will continue the command to the installed hardware to cut off the motorcycle's electricity so that motorcycle engine will not start.

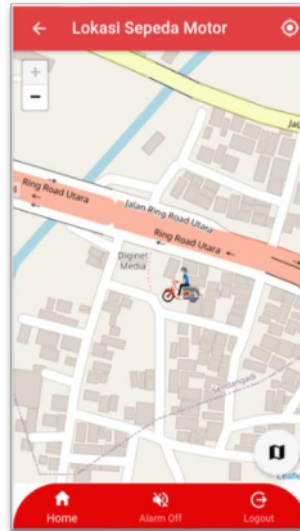


FIGURE 7. Motorcycle Location Monitoring

This display will appear when the user presses the location button so that the user will be directed to a page like Figure 7 where on this page the user can see the location of the motorcycle with a visual map in real time and the FABs (Floating Action Buttons) button with the maps icon serves to navigate the current location of the user to the location of the motorcycle.

CONCLUSION

The system that has been designed can improve motorcycle safety for the better and already has an interface for the control system, this system can be used as a remote control system to turn off and turn on the motorcycle engine and track the location and history of motorcycle trips with visual maps through the android application. This system also provides a navigation feature to the location of the motorcycle, then can provide service features for the nearest location such as the location of gas stations, ATMs, hospitals and police stations. This system is designed using Arduino Uno and SIM808 module. The SIM808 module is used as an internet modem to help the hardware that has been designed communicate with the server, this motorcycle smart lock system hardware is designed to control the motorcycle's electricity and transmit GPS location data for the motorcycle where for sending the data it uses GPRS which is on the SIM808 module and for GPS location data can be obtained from the GPS sensor that is already embedded in the SIM808 module.

ACKNOWLEDGMENTS

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PAGE 3



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PAGE 4



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PAGE 5



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