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Internet of Things

Smart Helmet for Motorcycle Safety Internet of Things Based

Mhd Hafizh Azman Matondang *, *Ahmad Asadel, Daris Fauzan, Anwar Rudi Setiawan*

Department of Information Technology, Faculty of Computer Science and Information Technology, Universitas Muhammadiyah Sumatera Utara, Medan, 20238, North Sumatra, Indonesia

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* CORRESPONDENCE

Phone: +62 851-6314-6431
E-mail: mh8716185@gmail.com

A B S T R A C T

IoT (Internet of Things) is a concept that aims to utilize continuously connected internet connectivity, there are several IoT capabilities including data sharing, remote control and so on. One use that can be used is for security purposes, such as for safety riding, namely a Smart Helmet. The emergence of cases of motorbike theft and robbery requires vehicle owners to be more careful and increase their vigilance. Much has been done to prevent motorbike theft and robbery, for example using multiple locks and installing alarms on vehicles, but unfortunately some of these methods cannot completely overcome the rampant theft and robbery that is currently occurring. Apart from that, awareness among motorcyclists regarding the use of helmets is currently very minimal, which will have a fatal impact if the rider is involved in a high-profile accident without wearing a helmet. This thesis proposes a solution by developing a smart helmet, namely by providing facilities and equipment to anticipate crime while driving. Apart from that, this smart helmet will send a message if a robbery occurs and immediately send the driver's position. This helmet is integrated with the motorbike engine so the motorbike engine will stop if it is far from the helmet and the motorbike will not start if the helmet is not used. This Smart Helmet is designed based on IoT by using a Wireless module to connect to the motorbike engine, a GSM module for the alarm and notification system, and a GPS module to determine the location which is integrated with Google Maps.

INTRODUCTION

Economy is less than optimal and basic needs are increasing which is inversely proportional to income, as well as limited employment opportunities for lower class people, make some people think short-sightedly to find a short way by taking rights that do not belong to them, one of which is by committing theft and the most Motorbike theft is rampant, which is increasing every year. Various crime cases in Indonesia continue to increase every year. Data on crime cases in Indonesia for the last 4 years, namely in 2010 the number of crime cases was 332,490 cases, in 2011 it increased to 347,605 cases, in 2012 it decreased to 316,500, and in 2013 crime cases also decreased by 305,708 cases, but In 2014 (January – November 2014 period) the number of crime cases increased again to 314,258 cases and is expected to continue to increase until the end of December 2014 [1,2,3].

There are several ways to protect yourself from motorized robbery crimes, such as arming yourself with permitted weapons such as Pepper Spray, preparing your cell phone to make emergency calls to the police station, avoiding quiet roads. However, all the rescue methods above are still not able to overcome it completely. Apart from that, accidents often occur in Indonesia which result in death and quite a few people still underestimate driving safety and traffic regulations which can lead to self-injury [4,5].

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From BPS (Central Statistics Agency) data in 2015– 2017, the number of crime incidents or criminal acts in Indonesia tended to fluctuate. In 2016 the number of crimes increased by 1.2%, then in 2017 it fell to 5.75%.

Seeing this problem, the author wants to provide a safety system for helmets for the safety of IoT-based motorbike riders with the title "Smart Helmet for IoT-Based Motorcycle Safety", the working method that will be designed is that if the rider does not use a motorbike helmet, it will not be able toturn on even though it is on. using the key. Because this helmet makes the helmet the second key to being able to start the motorbike. If a motorbike is stolen, the helmet will automatically send an emergency message and will also send GPS coordinates to the closest relatives and at a distance of 100 M the motorbike will stop. Riders are strictly obliged to use a helmet for safety when riding a motorbike [6,7,8].

METHOD

Data Collection Methods

The data collection methods that will be used in this research are:

1. Interviews
   The interviews used by researchers in this research were unstructured interviews, namely free interviews where the researcher did not use an interview guide that had been prepared systematically and completely for data collection. This interview was conducted with a group of motorbike riders
2. Literature Study
   To obtain accurate data that supports this research and preparation, articles, e-books and journals related to transmitters, receivers, GSM modules, GPS modules and other data related to this research were studied.
3. Tool Testing Method
   Black box testing focuses on the functional specifications of the device. The tester can define a set of input conditions and carry out tests on functional specifications program.
4. System Design
   Smart Helmets for IoT-based Motorcycle Security is a concept for the safety of motorbike riders from robberies/burglaries which are rampant on the streets. When a robbery incident occurs, the motorbike has been taken by the robber. When the motorbike is 110 meters away from the user, the motorbike will automatically turns off and sends an SMS notification in the form of the driver's coordinates [2,3].

System Design Method

When designing a system to be developed, you can use the prototype method, where this method is suitable for developing a device that will be redeveloped. This method begins with collecting user needs, in this case the user of the device being developed is a motorbike rider. Then creating a quick design which will then be re-evaluated before being produced properly[9,10].

A prototype is not something complete, but something that must be evaluated and modified again. Any changes can occur when the prototype is created to meet user needs and at the same time allow developers to better understand user needs.

The following are 5 stages in the prototype method, including the following.

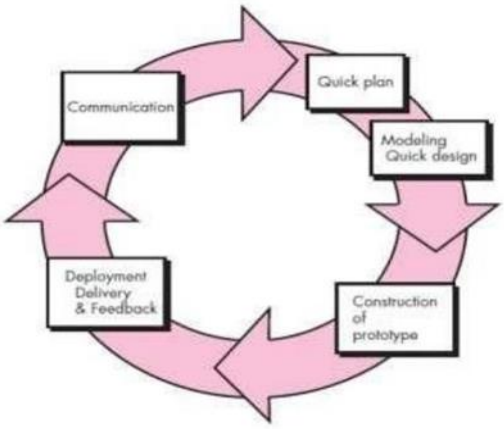

Fig 1. Prototype Stage Process

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RESULTS AND DISCUSSION

Quick Plan

Quick Plan: Quick planning after communication is established. From the results of the communication above, a quick design was created which can be explained in the following Block Diagram image:

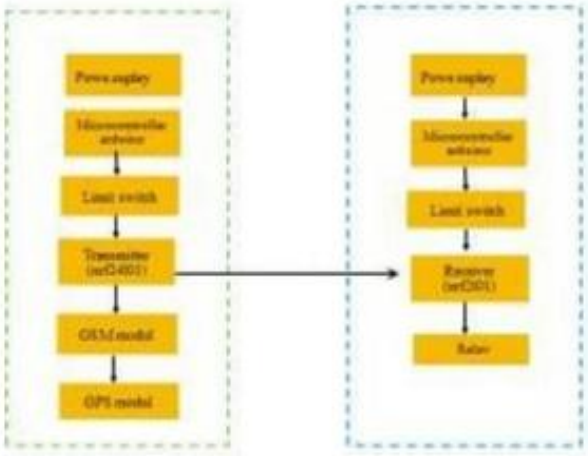

Fig 2. Block Diagram

Modeling and Quick Design

Basically the working principle of this system utilizes transmitter and receiver modules as input from the microcontroller, while the Arduino is in standby, which can then work to turn off the relay when the transmitter and receiver are not connected and when the realy is off the Arduino will send a message in the form of an SMS notification using the GSM Module and GPS Module which have been previously programmed and uploaded to the Arduino .

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The following is a schematic of the tools that will be designed in the Smart Helmet system for IoT-based motorbike safety.

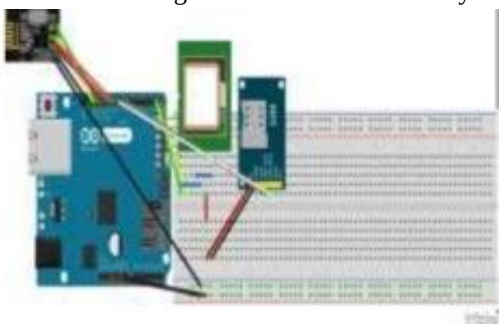

Fig 3. Design Scheme for Equipment on a Helmet

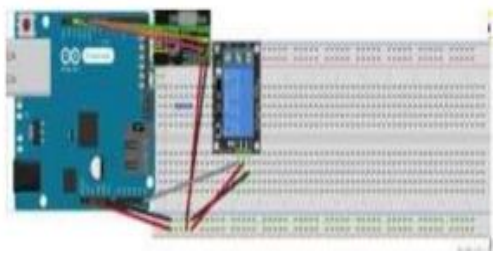

Fig 4. Motorcyle Tool Design Scheme

Constructions of Prototype

Quickdesign leads to the creation of a prototype. At this stage, the design of the tool has been determined and carried out on the Arduino Microcontroller as a control medium.

1. Coding After
   Designing the tool according to the scheme, the next step is coding. This stage involves writing the program source code based on the system design that has been created.

   The tools used in making this system are Arduino IDE with the C programming language.
2. Implementation
   After coding, tool design is carried out, such as integrating sensors into the Arduino microcontroller.

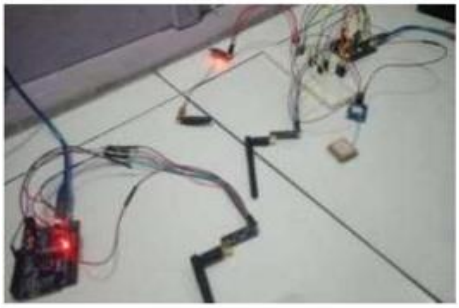

Fig 5. Prototype Design

From the picture above you can see the physical form of the design of the device being designed, in which there is an Arduino as the core of the program controller for data to be connected to the device.

Smart helmets for safety purposes were developed into two sided devices on helmets and motorbikes using an Arduino Uno, Transmitter and Receiver Modules for transmitter and receiver operations, GSM modules, GPS modules, to activate the Arduino microcontroller devices and other components we need a power supply.

The Prototype Uses a 9 V Battery

To turn on and turn off electric current to the arduino microcontroller in the helmet, the switch used is a limit switch. The limit switch is used to save power if the smart helmet is not used on the side of the helmet, communication with the motorbike engine using the module, using the transmitter and receiver module transmitter and receiver. This transmitter functions as a sending signal to the receiver installed on the motorbike.

The GPS module is used to determine the location of an accident and to send accident location information to the next of kin. The relay functions as a switch to turn on or turn off the electricity in the motorbike engine. Meanwhile, to receive modules installed on motorbikes, they are integrated into the motorbike engine. This tool will work automatically by detecting digital signals to the receiver with an Arduino microcontroller. The GPS module is used to determine the location of an accident and to send information about the location of the accident to the closest family. The relay functions as a switch to turn on or turn off the electricity in the motorbike engine.

Deployment, Delivery and Feedback

The proposed prototype is then evaluated by the customer or user. Feedback is used to refine product needs.

Deployment

After the prototype has been created, testing is then carried out on the prototype to deteorfmthineetothoel performance and the level of success of the prototype itself. The testing method used in this research is Black Box Testing , where this testing method focuses on the fundamental
requirements of the device.

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Feedback

From the test results above, the results obtained are:

1. The Transmitter Module can transmit signals distance 200m to Receiver.
2. The relay turns off when the transmitter and receiver are not connected and the GSM module sends a notification in the form of a coordinate message from the GPS module.

CONCLUSION

Simulation and testing, the smart helmet prototype can run well and has no problems in use. With Smart helmets for motorbike safety, it is hoped that an effective solution to many problems will ensure the safety of motorcyclists. For security purposes. Motorcyclists cannot start a motorbike engine without wearing one and it is hoped that motorcyclists will be aware of the importance of wearing a helmet. The results of this project have proven that the motorbike engine will start if a helmet is worn.

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