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Implementation And Design of Security System On Motorcycle Vehicles Using Raspberry Pi3-Based GPS Tracker And Facedetection

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Abstract: One of the nations where land transportation is frequently employed is Indonesia, particularly on motorbikes or two-wheeled vehicles. Since there is not much economic growth to maintain the high level of sales, there are many people without jobs, which leads to criminality, particularly motorcycle theft. The rate of motorbike theft in society is currently rising. The researchers developed a security system using a GPS Tracker whose control was handled by a two-channel relay in response to the rise in motorbike theft. The webcam camera produces the greatest images when it is hidden by a tree. 100% of the time, Relay Components work to control the horn and electricity. Due to the short read-time of the location the first time, GPS has a high accuracy. The Raspberry Pi3 can send, receive, and process commands to the motorcycle security system. The motion sensors, vibration sensors, raspberry pi microcontrollers, relays, and servo motors make up the system architecture in general. This method operates when the motor produces a lot of vibration. The sensor will relay the vibration to the Raspberry Pi microcontroller's output and the microcontroller will then deliver a warning notification message. In the event of a theft, the motorcycle will be immediately within the owner's control. In addition, with security using facedetection, the public can detect the perpetrators of theft and it takes quite a long time to work on it. The security system on motorbikes using facedetection takes a long time to produce, but it can't be done optimally. The purpose of this creation is to improve the security system on motorcycles to make it more efficient and effective in identifying the perpetrators of theft. This system consists of a Raspberry Pi3 as the control center, a picamera as a face detector, and a buzzer as an alarm.

Keywords: Facedetection; GPS Tracker; Raspberry Pi3; and Security System.

INTRODUCTION

To combat the rise in motorbike theft, a security system is required. Currently, the only defense used by motorcycle owners in situations when thieves are skilled is a double lock. We require a better security mechanism for it. All social classes—upper class, middle class, and lower class—use motorcycles often(Ramadhani, Al-Khowarizmi, & Sari, 2021; Sari, Al-Khowarizmi, & Batubara, 2021; Sari, Al-Khowarizmi, & Ramadhani, 2021). Unfortunately, motorbike theft is becoming a more common crime at the same time. Although motorbike manufacturers have so far added extra security features to their vehicles, such as ignition keys and shutter keys, in practice these security features can still be readily bypassed by shady motorcycle theft specialists (Batubara dkk., 2021, 2022). The need for motorcycle manufacturers to develop a higher security system to give their customers a sense of security is growing along with technical advancements.

As a result, a user-friendly display and a motorbike security tool that can detect movement when the motorcycle is parked were created (Lin, 2007; Wicaksono, 2018). The main controller of the instrument to be constructed is an Arduino Nano Atmega328, while other components include a GSM 900A modem for SMS data transmission, a GPS Neo M8N navigation tracker, and an IC LM7805 5V voltage regulator. The goal of this study is to increase motorcycle safety and lower the rising annual loss rate for these vehicles (Edy, Gunawan, & Wijanarko, 2018; Sari & Batubara, 2020, 2021).

Before the face recognition process is carried out, face detection is a crucial first step. A precise image processing system is necessary to create a digital image that can identify a person by analyzing patterns based on

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a person's previously stored face's texture and form, which is a requirement for the growing use of facial recognition technology (Azhari & Utomo, 2018; Chen dkk., 2004).

In this study, a face recognition-based security system was used. This security was selected because it requires authentication via a face that has been registered in the system, making it impossible for someone whose face has not been registered to access the vehicle. In addition to being able to stop motorcycle theft, it is envisaged that if the criminals manage to force the motorbike security, they would be able to be stopped.

LITERATURE REVIEW

GPS Tracker

GPS tracking is a kind of remote monitoring that uses GPS satellites to determine the exact location of cars and other assets as a series of coordinate points. The location of the car or asset will then be displayed on a digital map that even those who have never seen a map can easily understand. When the GPS tracker is put on the car, the GPS receiver will get a signal with the coordinates of the car's location right away. The SIM card within the GPS tracker uses the GSM/GPRS network to communicate the coordinates of the vehicle's position to the tracking server every few seconds. The coordinate information will then be input into an understandable digital map to show the vehicle's trip path up to its latest location. The GPS tracker company has developed a tracking website through which users can browse the digital map (Aman & Asbari, 2020).

Face Detection

Identify applicable sponsor/s here. If no sponsors, delete this text box (sponsors). One of the most crucial first steps before the face recognition procedure is carried out is face detection. In order to create a digital image that can identify a person by analyzing patterns based on the texture and shape of a person's face that have previously been stored in a database or have been previously trained, an accurate image processing system is required with the growing use of facial recognition technology (Khan, Chakraborty, Astya, & Khepra, 2019).

Raspberry Pi3

A single board computer called the Raspberry Pi (Single Board Circuit) is about the size of a credit card. Using an ARM11 processor running at 700 MHz and the Raspbian operating system. Type A and Type B raspberry pis are available. The difference is that type A uses 256MB of RAM, while type B uses 512MB. An SD Card is used to store data instead of a hard drive. Additionally, it has an ethernet port, two USB ports, and an HDMI connector. Raspberry Pi needs 5V of power, with a 500mA or 700mA minimum current for type A and type B, respectively (Sari & Batubara, 2021).

METHOD

Input and output (IO) pins on the Raspberry Pi include the following :

1. General Purpose Input and Output (GPIO) is the first. These pins can be used to control actuators, such as LEDs, relays, and motors, which serve as digital data input or output devices, as well as to read input from buttons and switches.
2. Connectors for Display Serial Interface (DSI). When connecting LCD or OLED screens, this connector can be used with a 15-pin thin ribbon cable.
3. A connector for the Camera Serial Interface (CSI). This port serves as a direct connection between a camera module and the Raspberry Pi.

The research method used in this study are :

1. Analysis
   A new development is required to lessen various criminal acts that are extremely harmful to society. To do this, an analysis of the issues that the community faces as a result of the theft of motorbikes by thieves that happens in quiet places must be conducted.
2. Draft and Design
   Design comes after analysis in the development process. Utilizing flowcharts, create prototype security simulations and tools for motorcycles, including the necessary software and hardware. There are hardware and design input and output ranges available.
3. Coding
   Make advantage of Python Idle, a programming language, to code on the Raspberry Pi 3.
4. Implementation
   The tool will be put to use in a motorcycling simulation utilizing the required equipment after it has been tested.

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RESULT

The relationship between the supporting components of the system under design is visible in this design. Additionally, it can give system users an overview of the data that is generated by the system that is being designed. block diagrams and flowcharts are used to illustrate.

In order to better understand how the system will be built, block diagrams are used to represent the system's activities. However, it is also required to create an overview of the system as it is currently functioning. As illustrated in Figure 1 Designing a block diagram in a motorcycle safety equipment and Figure 2 Coding a block diagram, the following is a block diagram used in this study:

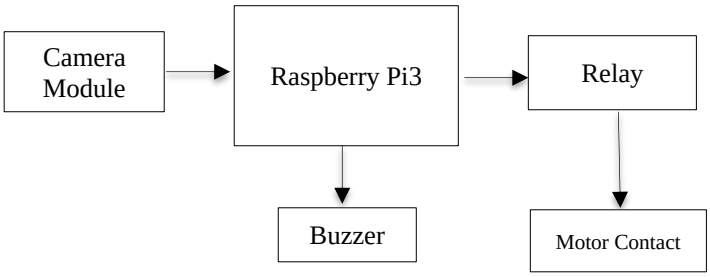

Fig. 1 Block Diagram Design

Fig. 2 Coding Block Diagram

A flowchart is a visual representation of the steps and order of a program's routines or a systematic exposition of the logic and process of information handling activities. Figure 3 of this study's flowchart depicts the image below. The following is the flowchart design for gas and fire leak detectors:

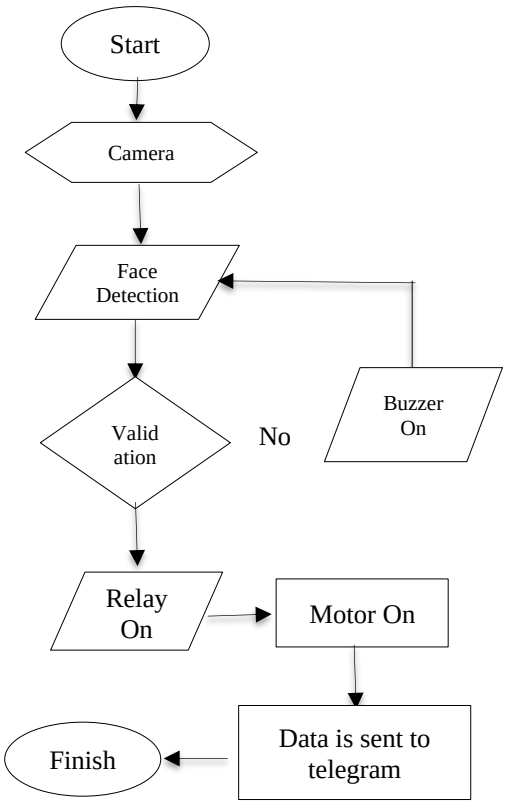

Fig. 3 Motorcycle Safety Flowchart

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DISCUSSIONS

When a face is detected in front of the camera by the Pi camera, the system of this device will activate, and the facial data will then be delivered to the Raspberry Pi3 to be temporarily saved. The motor will turn on and then automatically send a telegram message notice to the smartphone if the facial data matches the dataset and the buzzer will activate if the facial data does not match the dataset. Figure 4 depicts the design of the tools used in this study, and the following is a depiction of that design :

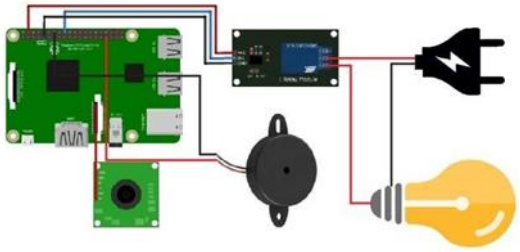

Fig. 4 Tool Design

The system analysis, problem analysis, and analysis of hardware and software requirements are obtained once the research technique is completed in order to construct a security system for motorcycles. The next step in system design is to create a system that will be used to recognize facial data, save it to a dataset, process it to create training data, and then submit the results to data recognition.

Setting up the motorcycle owner's and the thief's facial data. The alarm buzzer rings and the relay shuts off if the camera identifies the thief's face, protecting the electric current.

1) Product Result

The results of a hardware design for a motorcycle security system based on facedetection on a Raspberry Pi 3 are shown below.

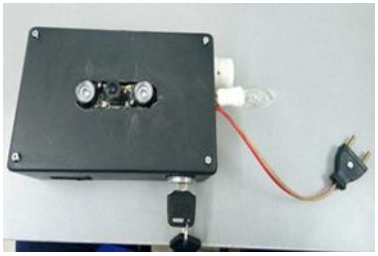

Fig. 5 The overall motorcycle security system appears using raspberry pi3

2) Test Results

Table 1 Test Results

No	Testing	Observation
1	Detects the owner's face	The relay is successfully turned on and the motor
2	Detect the face of a motorcycle thief	The relay cannot be turned on and the buzzer sounds

CONCLUSION

Based on the outcomes of the analysis, design, and implementation that has been done as well as the formulation of the current problem, it can be said that this tool is functioning properly and is able to detect faces in the dataset to operate the motorcycle security system. If the face detector is not automatically detected in the dataset, the motor will not run and the device's alarm will sound.

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