PROTOTYPE POWER HOUSE SECURITY SYSTEM USING FACE IDENTIFICATION AND MICROCONTROLLER-BASED VEHICLE IDENTIFICATION

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ABSTRACT- The rapid development of technology has had an impact on the power house area which has become an important place in various places. In general, power houses are needed in office areas, shopping centers and airports. A place like a power house is a place with a lot of equipment, a lot of tools at quite expensive prices. But usually the security in the power house only uses a key or RFID to enter the area. This method is considered less effective because the level of security is low and prone to damage.

In this study, the topic studied was a power house security system using face detection and vehicle detection. This study aims to maintain security at the airport power house. This tool is designed using Webcam to function as input to identify the user and vehicle number plate, then send the response to Arduino Uno as a microcontroller. There is an infrared sensor for detecting the entry and exit of vehicles. The name of the power house officer and the license plate of the vehicle will appear on the LCD screen display. The servo functions as an entry bar opener, the servo can be opened if the user can be recognized.

The prototype functions well as a security system in an airport power house where the security of this system identifies the faces of power house officer with a high degree of accuracy. In addition, this prototype can also detect vehicle license plates. After testing, it means that to detect 1 face and 1 plate it takes approximately 5 seconds after which the bar will open. When exiting or closing the gate it only takes 1 second because when a vehicle passes the sensor, the barrier will automatically open.

Keywords: Power house, Webcam, Arduino uno, User

1. INTRODUCTION

Currently, security in Indonesia is decreasing, as well as various security threats such as murder, robbery, theft. Theft can be found in various regions throughout Indonesia. Various modes of theft have sprung up, both theft of property and other valuable objects. The inadequate security system makes various places prone to theft.

A place like a power house is a place with a lot of equipment, a lot of tools with quite expensive prices. Therefore, the security system in the power house must be tightened not only with door locks but must be added to security so that access to the power house is not arbitrary and only people who have certain access can enter the area.

The use of RFID has been widely used in various places but if there is damage or loss, it cannot access the place. The rapid development of technology makes it easier for humans to carry out activities. One of them by only detecting faces can enter the area the area.

Double security is also needed such as only certain vehicles can enter the area.

Based on this background, the author made a research tool entitled "PROTOTYPE POWER HOUSE SECURITY SYSTEM USING FACE IDENTIFICATION AND MICROCONTROLER-BASED VEHICLE IDENTIFICATION", it is hoped that this tool can be used in the power house so that security can be maintained.

2. METHOD

In this chapter the author will explain the design of the tool to be made including block diagrams, as well as the workings of the hardware and software of the tool. The research method used in making this final project is to use hardware design, namely making tools and software design, namely making programming languages.

The webcam serves as input to identify the user and vehicle license plate, then sends the response to Arduino Uno. There are two infrared sensors each installed at the entrance and exit. The user name and vehicle plate will appear on the LCD screen display. The servo functions as an entrance bar opener, the servo can open if the user is recognized. user can be recognized.

3.4.1 Hardware

The following is an explanation of the circuit scheme of each component:

3.4.1.1 Infrared Sensor

The Infrared Sensor used is e18-d08nk, this sensor is used to detect vehicles that access the parking lot, then indicate the number of vehicles in the parking area. Based on the datasheet, the e18-d08nk infrared sensor has an output voltage of +5V DC, current consumption of 25mA-100mA, sensing range of 3cm - 80cm, NPN output (normally high), ambient temperature -25°C ~ 55°C, can detect transparent / opaque objects, has dimensions of 1.7cm x 4.5 cm.

3.4.1.4 Arduino Uno

The use of Arduino uno is because the esp32-cam is not able to bear the entire system. Arduino uno has 14 digital pins (6 PWM), 6 analog pins. The microcontroller used is Atmega 328P. RAM is 2K and EPOM is 1K. Clock speed is 16MHz. Recommended input voltage ranges between 7V and 12V. The maximum current on each pin is 20mA. Arduino uno is supplied with a 12vdc adapter through its power jack.

Arduino uno serves as the output control center. There is an infrared sensor output, and an emergency button. While at the output there are lcd and servo.

3.4.1.5 User

Users here are people who have done face registration to be able to access the parking bar. User registration is done in a web browser.

Python is a programming language widely used in web applications, software development, data science, and machine learning (ML). Developers use Python because it is efficient and easy to learn and can be run on various platforms.

The benefits of Phython include:

- Developers can easily read and understand Phyton programs because it has a basic syntax like in English.

- Phyton makes developers more productive because they can write Phyton programs using fewer lines of code compared to other languages.

- Phyton has a large standard library of code that can be reused for almost any task. Thus, developers don't need to write code from scratch.

- Developers can easily use Phtyon with other popular programming languages such as Java, C, and C++.

- The active Phyton community has millions of supporting developers around the world. If you're having trouble,

- There are many helpful resources on the internet if you want to learn Phyton..

3. RESULT AND DISCUSSION

Measurements were made to determine the distance range of the e18-d80nk infrared sensor in detecting objects. The measurement method is to place the object (paperboard) with different distances in front of the infrared sensor, while turning the potentiometer to the maximum reading and measuring the distance range using a

meter. In addition, the status of the sensor is also monitored on the serial monitor screen.

The sensor indicator led lights up, indicating that the sensor has detected an object. The distance between the object and the sensor is 0 cm.

4.1.2.1 Infrared Sensor Display Program

Here the infrared sensor works as an input to detect vehicles so that the input will instruct the program to open the bar.

4.1.2.2 LCD Program

Based on the picture above, when the sensor detects a vehicle and the servo opens, the LCD display will display an open door sentence if the vehicle has passed, the LCD display displays a closed door sentence.

4.1.2.3 Servo Program

The program is servo.write(90) to open and servo.write(0) to close. The servo will not open if it does not match the data, or the face with the vehicle license plate is different.

4.1.2.4 Test of Accuracy of License Plate and Face Recognition

Tests were carried out by registering the faces and license plates of several users' vehicles into the system, then comparing them with faces that were not registered, to observe the response of the system.

In the picture above is a display if the admin wants to add a user, first add the name and license plate, then click add employee. After that, move to edit the employee, fill in the name again then click edit photo, then add 5 photos of the user to be registered, for the photo the face is taken from the front right left top side, if you click the trainning model then the user data will be inputted.

For experiments, point the face at camera 1 and the license plate at camera 2, if the face and license plate are detected, the system will say "true" and the bar will open and the LCD will display the phrase "the door is open".
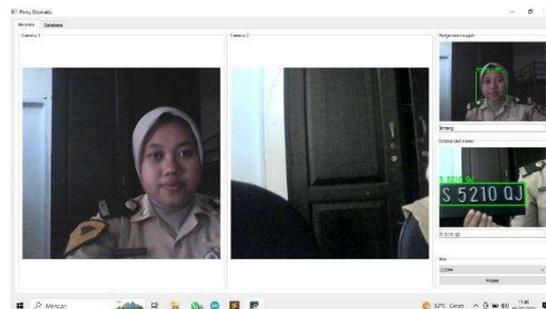

Figure 1. Face Detection

The detection process itself takes an average of approximately 5 seconds. And if the face and license plate of the vehicle do not match the data then the system does not work and the portal will remain closed.

Figure 2. Servo Open

Pros and Cons

4.2.1 Advantages

This tool is designed in such a way as to prototype a high-level security system for a place by detecting faces and vehicles.

4.2.2 Disadvantages

This tool uses image processing so that the process takes time to compare the accuracy of faces and license plates with others.

4. CLOSING

Conclusion

From the overall testing of the tool, the following conclusions can be drawn:

1. In the prototype of the power house security system using face identification and microcontroller-based vehicle identification, it is found that this tool can detect faces and vehicle numbers easily controlled by Arduino ideas and image processing.

2. This tool is designed in such a way for the security system at the power house. By using arduino uno as a microcontroller, face recognition and vehicle license plates are also with 100% accuracy matching between faces with registered vehicle plates.

3. At the time of initializing the face and plate takes time, after trying with 3 faces and 3 plates the average time to identify for 5 seconds. After being identified as valid, the bar will open.

Suggestion

From the results of testing this tool, there are some shortcomings, here are some suggestions that I can convey for future tool development.

1. Can use raspberry pi for system control and add load cells for vehicle detection.

2. The camera can use a better type of camera in terms of quality so that the resulting image can be clearer.

3. If the waiting time is too long, it is possible to do further research with a larger number of users.

4. Adding an emergency button for emergencies

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