

Implementation of Open and Close a Housing Gate Portal Using RFID Card

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Abstract- The implementation of the gate portal in Widya Graha I housing, Pekanbaru at this time is still done manually by the security and the application is not optimal because the portal is still often left open by the security. With the development of technology, it is necessary to have an automation system in using the gate portal so that the gate portal can be used more optimally. In designing an automatic gate portal using Arduino as the main controller for the gate portal, Arduino will send commands to the DC motor to open or close the gate portal with an RFID card as the opening of the portal and an infrared sensor as a portal cover, as a fingerprint detection sensor and Arduino as a controlling medium control data input processor. From the test results, the portal will be closed when the vehicle passes through the infrared sensor at a certain distance.

Keywords- Arduino, DC Motor, RFID Card, Infrared Sensor

I. INTRODUCTION

A safe and conducive home area is one of the things that every resident of housing expects was studied by roy [1]. Portal gate is one of the infrastructure that supports the security of a residential area was studied by irawan [2].

According to law number 1 of 2011 on housing and residential areas, housing is a collection of houses as part of a settlement, both urban and rural, which are equipped with infrastructure, facilities and public utilities as a result of efforts to fulfill a livable house was studied by Chowdhury [3]. At this time many developers offer housing with available facilities and infrastructure, one of which is a safe housing environment guarded 24 hours by security and this is an added value for the housing offered was studied by wei [4].

According to the big Indonesian dictionary (KBBI), a portal is defined as a gate or gate, a portal is also defined as a road (door) to enter underground mines, tunnels, bridges, and so on was studied by fatmawati [5]. The portal is a pole or bar installed at the end of the alley (road) to block the entry of certain vehicles was studied by mainetti [6]. The Widya Graha I housing complex, which is located on Jalan Srikandi, Delima sub-district, Tampan sub-district, Pekanbaru city has one access to enter the residential area and has used a manual gate portal for access in and out and guarded by security, but the use of the gateway portal is not fully implemented was studied by muhardi [7]. The gate portal in the Widya Graha I housing is left open by security and those who are not residents of the housing can enter the Widya Graha I housing area freely without the need to report to the security post so that crimes often occur such as breaking into the house of one

of the residents. was studied by taweel [8] and sohor [9] This makes the Widya Graha I housing area less safe and conducive was studied by kadel [10]. From these problems and with the development of technology, it is necessary to make a tool that helps in opening and closing the housing gate portal automatically using an RFID card was studied by irawan [11], so that anyone who wants to enter the residential area who is not a resident must first report to security because the portal will open was studied by mainetti [12] and close automatically by using the signal on the card that is only owned by residents of housing and security was studied by lin[13], so that a safe and conducive environment can be created was studied by pala [14].

II. METHODS

The waterfall model provides a software life-flow approach in an ordered manner starting from analysis, design, coding, testing, and support stages was studied by irawan [15]. The stages in the waterfall development method are as follows:

The method used in this research is the waterfall method. In the waterfall method, there are several steps taken, namely:

A. Needs analysis

At this stage the research was carried out in Widya Graha I housing which is located at Jalan Srikandi, Kel. Delima Kec. Tampan, Pekanbaru - Riau and a problem was found, namely the housing gate portal which was left open by security so that everyone could freely enter the housing area so that criminal acts such as thievery often occurred was studied by wahyuni [16].

B. Design

In this stage, based on the problems that have been analyzed in Widya Graha I housing, a gate portal is designed that can open and close automatically so that those who do not have access to the housing in the form of an RFID card cannot enter the residential area and must first report to the security was studied by kumar [17]. At this stage, it is designed how the system can read sensors on the RFID card and then the gate portal can open automatically was studied by fonda [18].

C. Tool Making

This tool will be made, designed after the design phase of the design is completed in approximately 2 months. The



manufacture of this tool includes making a housing gate portal prototype using a PCB board for testing before implementation was studied by joshi [19].

D. Implementation

The design that was designed in the previous stage is then implemented. In this system, the programming language used is C++ using Arduino Uno was studied by rouan [20].

E. Testing

Tests carried out at this stage are using an RFID card that is attached to the sensor then the portal will read the sensor and then open. After the vehicle passes through the portal, the portal will automatically close. Testing is carried out directly by the user was studied by zhang [21].

F. Maintenance

At this stage maintenance is carried out on the housing gate portal sensor so that the sensor can still run as needed was studied by mohandes [22].

IV. IMPLEMENTATION

A. Hardware Design

Hardware design is a design or series of tools used to implement housing gate opening and closing using an RFID card.

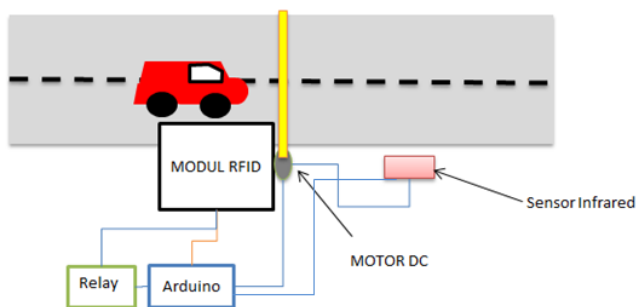


Fig. 1 Automatic Gate Portal Design

1) Power Supply Circuit

The power supply circuit is an electronic circuit that functions to convert the voltage from AC (Alternating Current) to alternating current to DC (Direct Current) voltage.

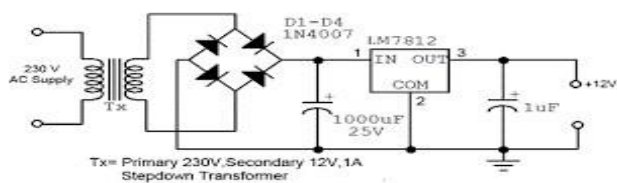


Fig. 2 Power Supply Circuit

2) Arduino Uno Minimum System Series

The minimum system functions to run the microcontroller so that it can work or function as needed, the minimum system circuit of Arduino Uno is seen in Figure 4.3.

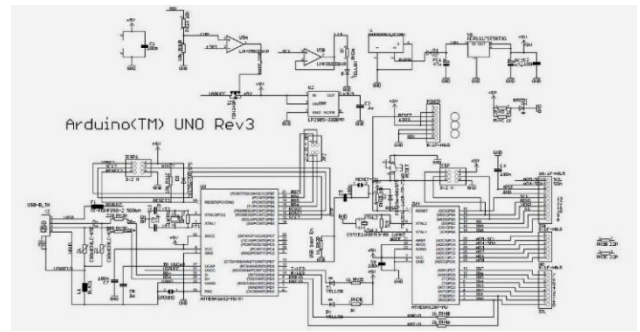


Fig. 3 The Arduino Uno R3 circuit

3) 3X4 Keypad Series

In this automatic gate opening and closing system tool uses a 3x4 keypad to register the RFID card on the RFID module.

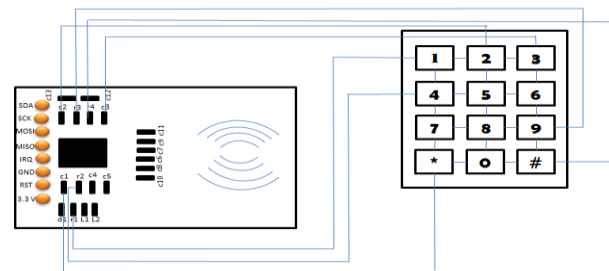


Fig. 4. 3x4 Keypad Series

4) Series of Portal Gates

The gate portal is connected to a DC motor to open a portal that utilizes an RFID card and module and to close the portal using an infrared sensor.

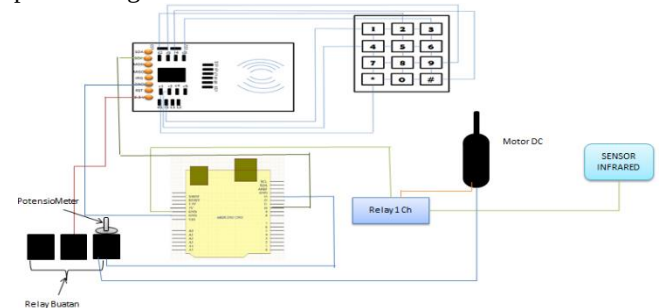


Fig. 5. Series of Portal Gates

Implementation is one of the stages in system development, where this stage is the stage of implementing the RFID module to open a gate portal.

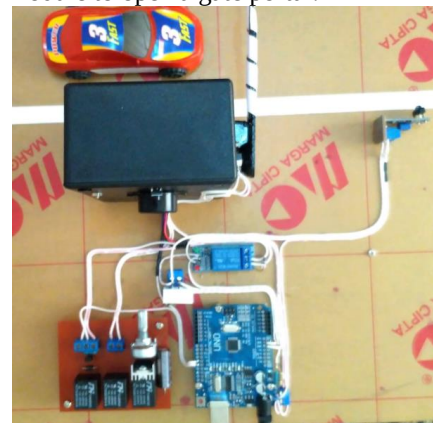


Fig. 6. Implementation of the RFID Module

From the picture in Figure 6, there are several supporting components for operating the automatic gate portals.

B. System Testing

The system testing of the RFID card is carried out with the following steps: Connect the mains current to the electrical power control hardware circuit.



Fig. 7. Devices Connected to Electric Power

After that the gate portal prototype will turn on with the supporting devices including the Arduino Uno, a dc motor, a power supply, and a series of relays.

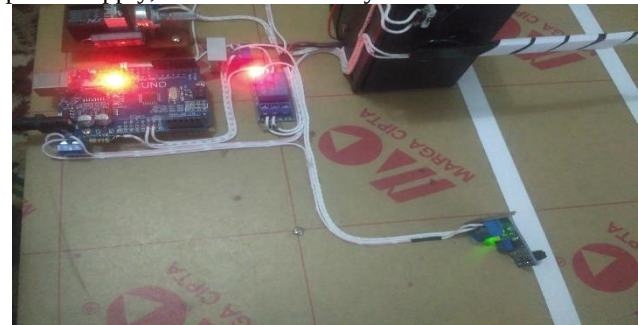


Fig. 8. Turned System Devices

C. Testing Opening a Portal with an RFID Card

This test is done by attaching the RFID card to the RFID module to open the gate portal.



Figure 9. Testing of Attaching an RFID Card

When the RFID card is attached, the light on the Arduino connected to pin 12 of the RFID will light up for 3 seconds if the RFID card is registered to the RFID module. If the RFID card is not registered, it will emit a beep 3 times. The RFID module in this system can read signals on the RFID card as far as ± 5 cm. Further testing is carried out by blocking the RFID module with objects to find out whether the RFID

module can read the signal or not which can be seen in the image in Figure 10.

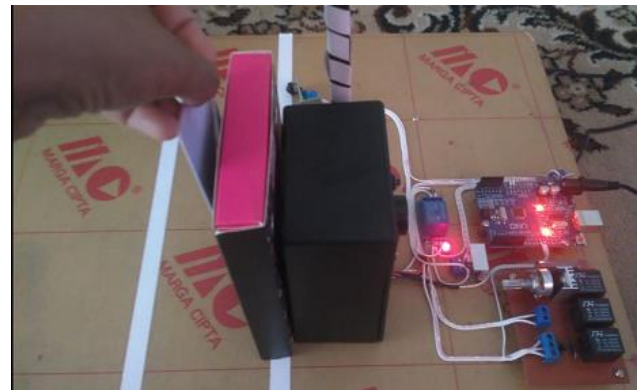


Fig. 10. Testing of Object-Obstructed RFID Module

When the RFID module is blocked by an object, the RFID module can still read the signal from the RFID card. The RFID module cannot read the signal when the card distance is more than 5 cm. The following is the table for testing the RFID card to open the portal.

TABLE 1. TESTING OF OPENING A PORTAL WITH AN RFID CARD

RFID	1	2	3	4	5
Card 1	√	√	√	√	√
Card 2	√	√	√	√	√
Card 3	X	X	X	X	X

Based on the table above, five experiments have been carried out using 3 RFID cards. Of the three RFID cards, there are 2 RFID cards that have been registered to the RFID module and 1 RFID card that has not been registered. After testing, the gate portal opens automatically with an interval of 3 seconds using the two RFID cards that have been registered to the RFID module and refusing or not executing orders from the unregistered RFID card.

TABLE 2 TESTING DISTANCE TO READ RFID MODULE SIGNALS

Distance	Detected	Not detected
1 cm	√	
2 cm	√	
3 cm	√	
4 cm	√	
5 cm	√	
6 cm		√

Based on the table above, the test is carried out on the distance the RFID module reads the signal from the RFID card. At a distance of 0-5 cm the RFID module can read the signal from the RFID card but at a distance of 6 cm, the RFID module cannot read the signal from the RFID card.

Furthermore, the test is carried out using an scratched RFID card. Testing is done by attaching the RFID card to the RFID module.

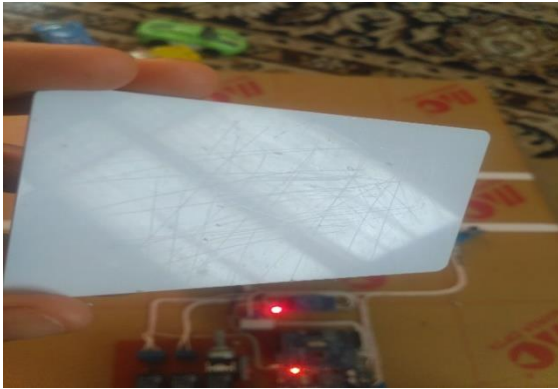


Fig. 11. scratched RFID card

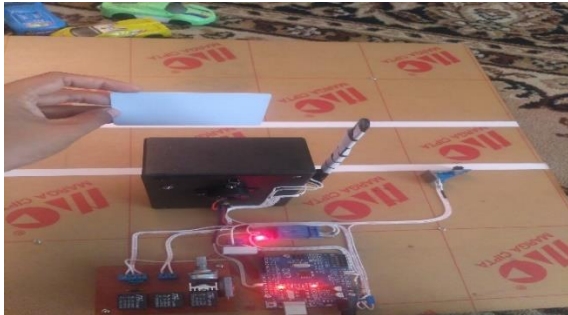


Fig. 12. Testing Using a Scratched RFID Card

From Figure 12, it can be concluded that the RFID module can still read the signal from the RFID card with a scratched condition.

The next test is to use a hollow RFID card. From Figure 15 the test is carried out by attaching a hollow RFID card to the RFID module. When the RFID card is attached, the RFID module does not give any response from the hollow RFID card.



Figure 14 RFID Card in a Hollow State

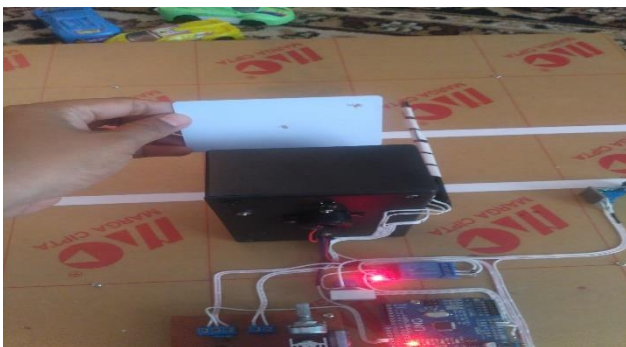


Fig. 15 Testing with a hollow RFID card

D. Infrared Sensor Testing

Infrared sensors are used to detect vehicles passing through the portal which will then close the portal. The following is infrared sensor test data:



Fig. 16. Detected Infrared Sensor Testing

Based on testing of the sensor, the sensor detects vehicles passing through the portal, if the vehicle has passed through the portal for a certain distance (in this study it is set at ± 4 cm) then the sensor will send an order to the DC motor to close the portal. Furthermore, when there is no vehicle passing through the portal, the sensor will not perform any commands. how the sensor works by reading whether there are objects blocking the infrared light from the sensor. If there is an object blocking the sensor is read and the light is on, which means the switch is open, otherwise the light does not turn on, which means the switch is close.

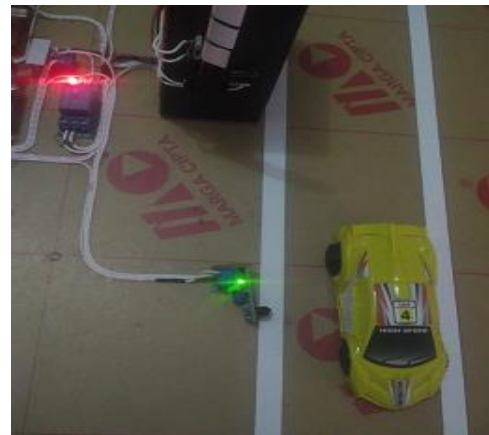


Fig. 17. Undetectable Infrared Sensor Testing

If not detected, the portal will remain open until a vehicle is detected by the sensor. This test can be described in the following table:

TABLE 3. TESTING INFRARED SENSORS TO CLOSE THE PORTAL

Infrared	Lights On	Lights Not On
Detected	√	X
Not detected	X	√

IV. CONCLUSION

After testing and analyzing this tool, it can be concluded that: From the test results, if the RFID card has not been registered, it will emit three beeps. From the test results, the portal will be closed when the vehicle passes through the infrared sensor at a certain distance. In order for the dc motor to be connected to the server, an Arduino program command is required in the form of program initialization. The suggestions for improving this tool are as follows: During the process of closing the portal using an infrared sensor, you should use an infrared sensor with a smaller sunlight sensitivity.

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