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# AUTOMATIC GATE BASED ON ARDUINO MICROCONTROLLER UNO R3

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## ABSTRACT

This research aims to design and implement a circuit that serves to open and close the gate automatically with remote control through a smartphone. It uses the Bluetooth HC-05 as a transmission between the smartphone and the Arduino Uno R3 microcontroller. To control arduino microcontrollers, the C programming language is used using Arduino software. The way this tool works is that the smartphone will use an app to send data to control the gate through arduino. First the smartphone must be connected with a connection between Bluetooth HC-05 and Bluetooth on the smartphone, after connecting the user can open a special application to control the movement of the gate closes or opens also stop the movement of the gate. When the user presses the button in the application, the data contained in the button will be sent via Bluetooth to the microcontroller for further execution. If the user presses the button to open then the DC motor as the gate mover will automatically move to open the gate. Stopping the movement of the gate can be done by pressing the existing button applied.

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### **Keyword:**

Gate  
Automatic  
Arduino  
Bluetooth  
Remote

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## 1. INTRODUCING

Automation at the moment now has a very rapid development. Keeping up with the times, automation can even be applied in any field, one of which is in the field of Smarthome or smart home. Automation in the field of smarthome is certainly very helpful in simple and difficult things at home. One of the things that can be applied in automation is the gate[1]–[3].

A gate is a large door where you get out or enter an area. Gates are useful for regulating or preventing the inflow of people. A large gate in a building can be a defense by closing or opening it. The gate is usually a door that is large, thick and becomes the only access to get in and out. In general, the gate uses a manual way to open it by being pushed and pulled[4]–[6].

The problem that arises is that when it rains car users will definitely bother with having to go down to open the gate while wet, other problems such as workers who go home at night and have to wake people home. The utilization of automation in the gate becomes one form of following the development of increasingly advanced times[7]–[9]. Automation in the gate is also one of the things to realize a smarthome that can help alleviate human work. The development of technology today has also affected the system of opening the gate so that the gate can be opened and closed automatically using a remote control[10]–[12].

Remote control is a remote control device that serves to control an object that usually has electronic components. But the use of remote control on automatic gates still has shortcomings. Remote control has shortcomings in the implementation of open and close the gate because often the remote control of the gate is left behind and can cause homeowners difficulty accessing the gate[13]–[15].

In this research makes a system in the form of a prototype gate that the design of this tool can be applied to open the gate automatically. This tool uses a smartphone as a remote to open the gate. Smartphones have become a staple of human gadgets today. Because the features and convenience provided by a complete smartphone does not make someone reluctant to leave it. Smartphones instead of remotes that have been used in most automatic gates are considered more practical[16], [17].

The smartphone was chosen because it has Bluetooth that can be used as a link with the tool to be made. Bluetooth is a communication media device that can be used to connect a communication device with a communication device. This prototype tool uses a controller that is an Arduino Uno R3 microcontroller. Arduino Uno R3 is a type of Arduino Uno that was released in 2011. R3 means the third revision. This microcontroller uses Atmel's Atmega328 chip. The chip is an 8-bit chip. Arduino Uno R3 was chosen because of its efficient microcontroller device with the ability to control tools, affordable price, and easy to learn[18]–[20].

## 2. RESEARCH METHODS

Tool design is an initial method in the manufacture of a tool that is very important because without a design the tool is made can not run optimally. To get maximum results, a good design is needed by paying attention to the nature and characteristics of each component used, so that component damage can be avoided. In the design stage consists of several stages, namely the design of block diagrams, tools and materials, the overall design of tools, flowcharts.

Planning requires rigor, tenacity and accuracy because early planning will determine the end of a plan in the tool manufacturing process. If the initial plan is wrong then the end result will be wrong. The design process is very necessary in the process of making tools, especially the design of electronic devices. The process of designing tools is very important to start a job with the following objectives

- a. So that the resulting tool will be in accordance with the expected.
- b. To choose the most appropriate components.
- c. To determine the errors or errors that occur.
- d. Minimize costs but with tools that are satisfactory results.

The block diagram below explains how the tool works as a whole from input, process, to output. In this block diagram there is only a path relationship between the blocks, but each block has a main component and supporting components.

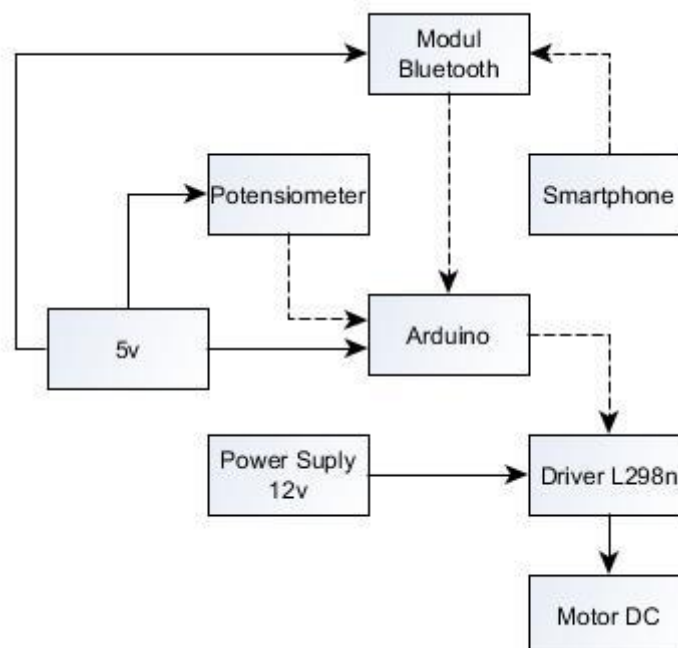


Figure 1. Block Diagram

### 3. RESULTS AND ANALYSIS

A flowchart or flowchart is a type of diagram that represents an algorithm, work flow or process, which displays steps in the form of graphical symbols. In the flowchart loaded in figure 2 explaining about how the tool works and processes work

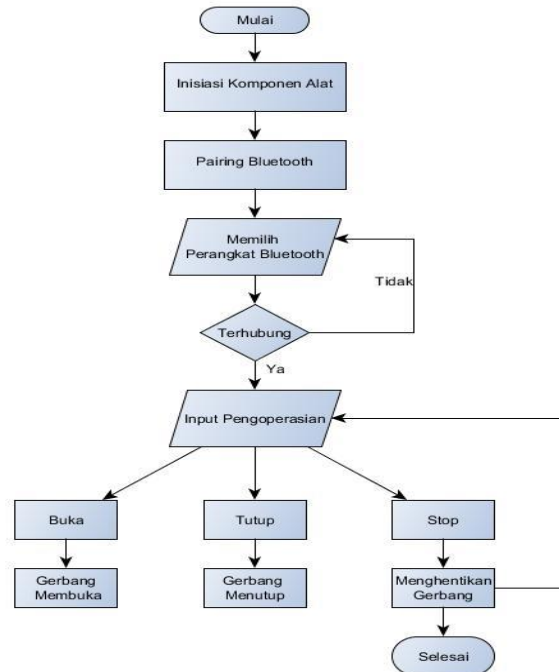


Figure 2. Flowchart Diagram

The first is the start and initiation of the entire component device. Then Bluetooth via smartphone will do pairing, to find the device to connect to. Once connected, through the smartphone device to perform input operations to command / send data to arduino in order to move the motor. If you choose to open, the motor will automatically move to open the gate. Once the motor has moved the gate to open or close fully, the device can send a signal back to turn off the motor.

Implementation of the tool is adjusted to the design that has been made. Starting from the application of components and connecting cables from components to other components so that the results are in accordance with the desired. Figure 3 shows the implementation that has been done.

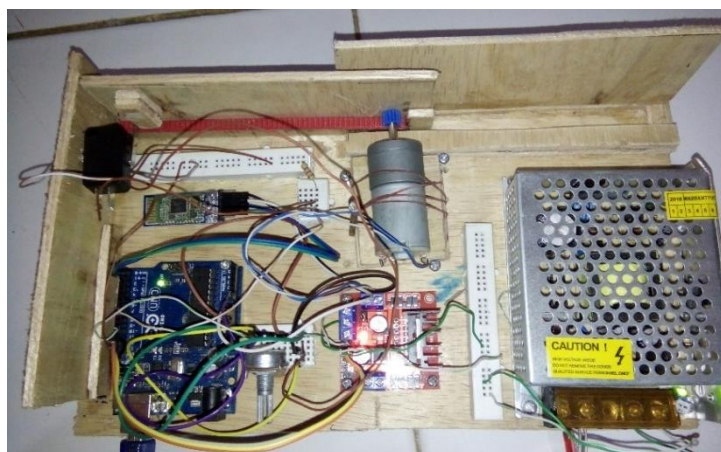


Figure 3. Implementation

In component testing will be discussed about testing based on the planning of the tools made and testing carried out in accordance with the planning discussed. First the test is done separately, starting from the components used in the design of this tool so as to get the desired results. After that the test continued with the testing of the entire series of microcontroller components that have been installed. Bluetooth module as a transmission media between smartphones and Arduino Uno microcontrollers. The test is done by connecting the Bluetooth module with the application on the smartphone. Bluetooth LED Module will blink quickly if the smartphone device is not connected, and will blink every 2 seconds if it is connected. In figure 4. Showing the Bluetooth module.

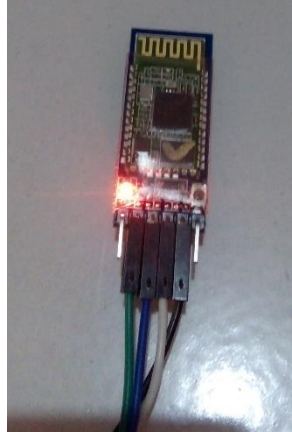


Figure 4. Module Bluetooth

Figure 5 is the initial view when opening the app. The scan button is used to search for Bluetooth module devices. After the Bluetooth module device appears, click the device to connect. Please note the device name of the Bluetooth module will match the name of the Bluetooth module device hc-05 as in the image display.

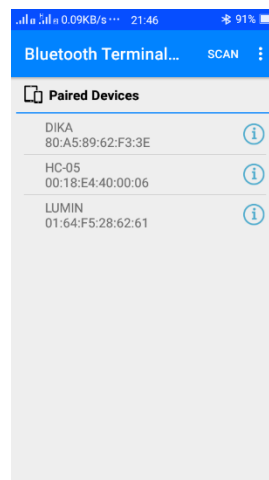


Figure 5. App Start View

If it is already inflated then the display that will appear is like above. At the bottom there are 3 buttons available to be able to control the movement of the gate, namely Open, Stop, Close. The resulting movement corresponds to the name of the buttons. If you press the open button then the gate will open, if it closes then the gate will close, and stop to stop the movement.

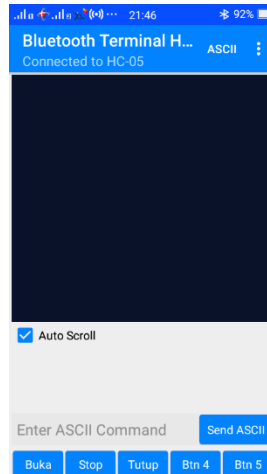


Figure 6. View After Connecting

The Bluetooth HC-05 module has a limit on usage that can only be accessed by 1 device. If another device wants to connect, the Bluetooth HC-05 must be free from other device connections. This means that the Bluetooth HC-05 module can only be accessed by 1 device in turn. The HC-05 Bluetooth module also has a limited range for its range. Testing is done by trying to connect the device with obstacles and without obstruction. Testing is also done by testing the range when the device is connected. Here's a table on the distance limits that can be reached. From the tests that have been done, the best distance to access the smartphone remote is 9 meters with no obstacles, and for those with obstacles the best distance is 7 meters only. The obstacle in question could be a wall or something that can block the smartphone's remote from accessing. Test results for applications can be applied on any branded smartphone with the provision of Android OS at least 4.0 to be able to install the application. In testing there is also an error, which is when testing accessing the tool with a smartphone and the test data is shown in the following table.

Table 1. Test Results

Testing To	Test Results
1	Success
2	Error
3	Success
4	Success
5	Success
6	Success
7	Success
8	Success
9	Success
10	Success

Based on the results of the table there was an error during the second test. The error occurs because when the remote application is opened the tester immediately tries to connect to the tool without waiting for a pause first and the result is an error. So when opening the remote application you should wait at least 2 seconds before connecting the device to the tool.

#### 4. CONCLUSION

Based on the results of the study, it can be concluded that a microcontroller-based automatic gate system in the form of prototype and prototype can be used. The prototype shape on this tool is a miniature gate adapted to the gate in real life. The program also runs in accordance with what is needed, namely opening, closing, and stopping the movement of the gate. Control the movement of the gate through the smartphone remote via Bluetooth transmission media which in the test can be accessed in a maximum distance of 11 meters without obstruction and a maximum distance of 9 meters if with obstacles. To be able to develop this tool, it is expected that the developers can further modify the components used in the design of this tool, namely the addition of ultrasonic sensors so

that if anyone blocks the gate when closing or opening the gate can stop, Microcontroller Replacement with mini pc system so that the system can run quickly.

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