Floor Cleaning Robot Control System with Android Based Voice Command

Ruri Ashari Dalimunthe*, Maulana Dwi Sena, William Ramdhan
STMIK Royal Kisaran, Indonesia
*ruriashari1986@gmail.com

Abstract. To clean the floor, it can be done manually by using a floor mop along with floor cleaning fluid, but this will result in a floor that is already clean but the implementation time is long enough to interfere with the time of mothers who are office workers or manufacturers to help their husband's income. In the process of cleaning the floor, cleaning the floor can be done until the floor is clean so that the children are comfortable playing on the floor. The process of cleaning floors can be done in various ways, either manually or automatically. To clean the floor with a large floor size more quickly, the floor is cleaned with machine power. But the range and limitations of floor cleaning machines exist. So it is necessary to make a robot that works automatically without human assistance to do the cleaning so that the job is done quickly and the area limit of the cleaning results is greater. The system will work using pengerek technology remotely using bluetooth. This system aims to connect communication between wheeled robots and smartphones via Bluetooth communication media. From the test results, the author has successfully applied bluetooth technology to a wheeled robot by providing instructions such as forward, backward, turn right, turn left, and stop. This robot is used to clean floors quickly and practically so that it can be done by itself.

1. Introduction
The development of technological improvements nowadays has changed the development of robot design components, such as most applications for all jobs. With the Arduino Uno microcontroller control connected with a bluetooth connection, it can control the movement of the robot to clean the floor in cleaning the floor in a large house so that work can be done quickly and does not require household assistants so that it does not incur additional costs.
Robots in every industrial and business position are now needed. This is especially true in terms of cleaning the floors in the house so that the occupants of the house are protected from germs and diseases. Housewives who also work actively outside the home are helped recently so that housewives no longer have difficulty cleaning floors quickly and practically. So that the work of mothers is no longer hampered because they can complete it practically.

With the Arduino Uno microcontroller control connected with a bluetooth connection, it can control the movement of the robot to clean the floor by tracing each side of the floor to clean the floor so it can be finished quickly. This robot can later be used in urban areas in Asahan district, to be precise in the city area.

2. Methodology

The process of deepening and exploring existing problems in order to create a system that can run as expected. The problem identification process will create a problem which will then be analyzed. The process of analyzing a research problem is a step to understanding a problem that has been found and determined. This research was conducted in order to add to the vocabulary of rules, concepts, theories that support research completion. This research is conducted through an understanding of books and journals that are related to the research being carried out.

This study was conducted to strengthen the basics of conducting this research so that it cannot be separated from the applicable provisions. Development of the system includes designing a system with hardware and software parts. After the PCB layout has been completed, insert the component legs according to the circuit and also attach the cables needed to connect the circuit to the power supply or to other parts of the device. Hardware and Software that are designed to be completed, it is necessary to test whether they can run as planned and in accordance with the objectives of the research.

3. Result and Discussion

It takes a test of the circuit design that has been made. So that it can produce a robot that works in accordance with the orders given via a smartphone. This system is used to drive a dc motor that works based on the control of the HP smartphone. Where on the smartphone, the sound storage has been carried out which will be detected by the sound sensor that is installed on the Android smartphone. The sensor is connected to the BT Voice Control For Arduino application which is also installed on the smartphone. To receive the signal sent by the sensor is bluetooth. This Bluetooth has been connected to the Arduino microcontroller. The received signal will activate the Arduino according to the stored program. Arduino will output voltage to the driver so that the driver will connect the current to the dc motor will work or rotate.
This means that this system requires a smartphone as a sensor application, a bluetooth HC-05, an Arduino microcontroller as a control center, a driver and a dc motor as an electrical load to be controlled by the system to be made.

**Figure 2.** How the Android-Based Control System Works

For a smartphone design that functions as a sensor to control a dc motor, it can be done by installing the BT Voice Control for Arduino application via the Play Store. Once installed, we record the sound with the applicable words to turn the dc motor on and off. This voice recording will later be recognized by the sensor application so that it can be a signal that can be detected.

For the Bluetooth HC-05 design, which will be connected to a smartphone using a 2.4 GHz band or frequency, Bluetooth is used. Also the Bluetooth HC-05 is also connected to the Arduino Microcontroller using pin D11 connected to Rx (receiver) and D10 to Tx (transmitter) and also connected to VCC and Ground of each device.

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**Figure 3.** Bluetooth HC-05 Connected to Arduino

The design is to provide a driver connected to the circuit to drive a dc motor. This driver design consists of the L293 D IC as a control to control the logic that enters through the input section, which is then processed by the IC to drive the dc motor on two sides of the output, thus connecting the current to the two dc motors given the input. from the Arduino microcontroller.

The battery design for the control robot with sound sensors uses 4 batteries with a voltage of 1.5 connected in series, so that an overall voltage of 6 volts will be obtained. The design can be seen in the image below:

**Figure 4.** Battery Design
To run this system, it is necessary to make a hardware design consisting of designing a Bluetooth circuit, an Arduino circuit, a series of drivers connected to a dc motor. Bluetooth module HC-05 with a large supply voltage of 3.3 V to pin 12 of the Bluetooth module as VCC. Pin 1 on the Bluetooth module as a transmitter then pin 2 on Bluetooth as a receiver.

The control device that will be built is to turn on two DC motors on a mobile robot that moves forward, backward, turn left, turn right and stop, so that this tool can make it easier for us to control the robot with the movements specified in the program. In controlling this dc motor, it is carried out using voice with words that have been stored in the Arduino microcontroller IC.

For system application, system testing is required. This system is made using a smartphone based on Android, so this tool consists of a series of microcontrollers, as a control center for dc motor control, a Bluetooth HC-05 circuit, an Android smartphone control, drivers and dc motors as well as a boarduino voice of control application program or software. To ensure that the designed tool works as expected, hardware and software testing is also carried out.

Testing of this program is carried out in the first way where the microcontroller carries out the initialization process first according to the type of microcontroller used, for this program in particular using the Arduino Uno Microcontroller. After the initialization process is successful, the next step is to initialize the relationship between the microcontroller and the other series of systems. The system relationship in the

This system will work when voice input with certain words on the Android voice control smartphone, the microcontroller gets input from the frequency emission. The software used in the DC motor control system using an Android voice control smartphone is the Arduino Ide programming in C language. After the program is designed, the program is then uploaded to the microcontroller directly via a PC or laptop to save the program to the Arduino chip.

To test the program that has been designed successfully and according to what we want, the program before compiling does an error occur. Then the sketch is uploaded to be saved on the Arduino chip. After that we give the voice on the android smartphone vice control.

Testing can be carried out by giving the program into the microcontroller IC. The program used is the C language. To experiment with a series of drivers by pressing the button on the android application. After we press it, we say the command word that has been stored. Forward command, the driver works so that the two dc motors rotate towards the right. Then if we say backwards, the two dc motors will rotate towards the left. The circuit can be seen in Figure 3 below:

| Table 1. Power Supply Testing |
|-------------------------------|
| No  | Input (ac) | Resistor (ohm) | Output (dc) | Information |
|------|------------|----------------|-------------|-------------|
| 1    | 220 V      | 1 K            | 12          | Stable      |
| 2    | 220 V      | 4K             | 12          | Stable      |
| 3    | 220 V      | 30 K           | 10.90       | Not Stable  |

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Figure 5. Testing Driver Series

DC Motor Specifications:
- Voltage = 1 – 6 V DC
- Current = 0,30 – 0,35 A
- Rotation Speed = 1500 – 1700 rpm

Current measured can be calculated with:
\[ I = \frac{P}{V} \] \hspace{1cm} (1)

Where:
- \( P \) = Motor DC power (Watt)
- \( I \) = Current Dinamo DC (Ampere)
- \( V \) = Voltage (Volt)

Contoh:
Known: Motor DC power 5,0 Watt
Voltase (Baterai) 6 Volt

Ask: Current powered? Solution: \[ I = \frac{P}{V} = \frac{5,0}{6} = 0,86 \text{ A} \]

On power 2 unit motor DC 10 Watt
so that the current becomes \( 0,86 \times 2 = 1,72 \text{ A} \)

As a determination to obtain the distance between the robot and smartphone, it can be done. By turning on the robot, the smartphone is taken away from the robot until a distance is found that will not be able to control the robot.

Table 2. Testing Distance between Smartphones with Robot

| No | Distance (m) | Result | Robot |
|----|--------------|--------|-------|
| 1  | 2            | Move   | Move  |
| 2  | 4            | Move   | Move  |
| 3  | 6            | Move   | Move  |
| 4  | 8            | Move   | Move  |
| 5  | 10           | Move   | Move  |
| 6  | 13 etc       | Not Move |
4. Conclusion

From the discussion in the previous chapters conclusions can be drawn, namely:

a. Dynamo control is carried out remotely with the required frequency is the frequency, namely: 2.4 KHz on this signal in controlling the dynamo works well as far as a maximum of 10 m,

b. To activate a dynamo, it must be calculated from the power specifications printed on the motorbike so that later the designed tool works as desired and can move to perform cleaning.

c. In the case of a dc motor for floor cleaning, it must use a separate voltage source so that it does not interfere with the electrical driving of the wheels.

d. In implementing this robot into use, it is necessary to directly use an additional control device in the form of a relay with a voltage of 24 volts so that it can connect equipment with greater power.

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