Control of Electronic Devices Using Smartphone-Based Voice Identification

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Abstract. This study aims to design the control system of an electronic device using voice identification-based smartphones generating electronic device control system. It optimizes the smartphone functions as a mobile phone than as a means of communication. The method used using the technique of direct observation by observing the success of the software AMR voice in identifying sound. In this design process smartphone as a sound receiver module, arduino as a controller, Bluetooth module as the sender and recipient of the data, and the relay as a contact breaker and connecting the electric current, as the output of LCD used to display information on whether the results of voice identification is correct or incorrect. Research tools electronic control device can control electronic devices such as fans, lamps and others depending on what is to be controlled. From the test results it can be concluded that the system control electronic devices by using voice identification-based smartphone that has been designed is divided into several parts, namely the Bluetooth module HC-05, arduino uno, relays and software AMR voice as a controller that has been tested to work and function properly.

Keywords: Smartphone, AMR Voice, LCD, Arduino, Bluetooth, Relay

1. Introduction

In general, the public is familiar with remote control and room control devices that can control an electronic device, such as television, audio video, air conditioning, etc. There are many technologies that have been developed by researchers to help humans in the field of control and security of electronic devices such as examples of controlling a home or building device via SMS, Web, telephone, or E-mail. Several studies have been conducted, by making an electronic equipment control system prototype via Bluetooth using voice recognition that allows users to give voice commands that can control electronic equipment wirelessly using a smartphone [1]. The Smart Door Lock system is used to open or lock the server room door with voice commands, By opening the Door Lock application on a smartphone that is connected to Bluetooth and the internet gives voice commands. After that the received voice command will be processed by Raspberry pi 3 by providing 2803 external ED data as IC to increase the voltage, so that it can drive the solenoid as a door lock according to the voice command that has been given [2]. Research has also been carried out by developing electronic device control and monitoring applications that are integrated with Google voice to control with 8 vocabulary words as a command i.e. lights, lights off, fan on, fan off, check
temperature, check plants, plants and checks. Applications can be used as controls on lights and fans and can take data from temperature and humidity sensors with the maximum distance of control is 25 Km with an average response time counted from the user finished giving commands until the execution by the master node is 2 seconds[3]. Another study by combining Android smartphones, Wemos Microcontrollers, Relays, and Sensors. This is done so that users can control electronic devices via a smartphone via a button or sound that will greatly facilitate the user [4]. According to C. Outwater, the Smartphone also promises to become the portal allowing secure personal authentication, mental and physical evaluation and secure access control, so the use of smartphone will work efficiently [5]. Besides, conforming to Mehrgan, the invention of the new control system using smartphone features a solution to use it or any other type of mobile personal computer as the main computer of a vehicle, in the highly computerized future vehicles. By connecting the smartphone, to the car interface, it will become the brain of the machine, and acts as a vehicle computer system [6]. Other than that, Rodriguez stated that the use of portable devices (e.g., smartphones) may work both to sense content information (e.g., audio and imagery) and context information since device processing is desirably dependent on both [7]. Furthermore, the use of control devices, and more particularly to hand-held communication devices enabled as remote control devices for managing delivery of digital television content, besides using the other devices [8]. In addition, from the research conducted by Woo, there is provided a digital device control system using a smart phone, including a smart phone that has an application of a remote control function, a digital device of which on/off of a power supply, channel or volume is controlled by a signal received from the smart phone, and an IR repeater functioning as a central control unit connected to the smart phone through Bluetooth or Wi-Fi communication [9]. Last, T.F Economy explained that a load control device is able to receive radio-frequency (RF) signals from a Wi-Fi-enabled device, such as a smart phone. The controller controls the controllably conductive device to adjust the power delivered to the load in response to the wireless signals received from the wireless network [10].

From the studies have been conducted, this research aims to design the control system of an electronic device using voice identification-based smartphones generating electronic device control system. It optimizes the smartphone functions as a mobile phone than as a means of communication (see Figure 1).

2. Method
2.1 Hardware Design

![Figure 1. Flowchart Research System](image-url)
The design of electronic device control devices using smartphone-based voice identification consists of input diagram blocks, process blocks and product blocks (see Figure 2).

2.2 Product Design

![Figure 2. Installation layout](image1)

**Information:**
1. AMR voice as a voice identifier software on a smartphone that is connected directly to Google Voice, which is then processed into serial data
2. Bluetooth on smartphones connected with Bluetooth modules
3. The Bluetooth module continues to send data in the form of serial data
4. Arduino executes commands received from Bluetooth and sends them to relays which act as key switches.
5. Next the electronic device lights up / ON as the sound output (see Figure 3).

**Block circuit diagram**

![Figure 3. Block Diagram](image2)
3. Results and Discussion
The first step that must be done in making a circuit is to make a schematic series of control devices consisting of several parts. Here are some parts of the schematic design drawing of electronic device control circuits using smartphone-based voice identification (see Figure 4).

![Figure 4. Arduino Uno Schematic and Bluetooth Module HC-05](image)

After the scheme has been established, we must pay attention to several constituent components contained in the circuit. After we design the parts in the circuit, next is connecting the parts of the circuit with driver relay into one circuit, which of course is an Arduino circuit that becomes the center of the circuit which is the overall controller. After we have finished the above process, the next step is to examine the relationship between each component so that there are no lumps or stick to one another, of course this can make the damage to the components (see Figure 5).

![Figure 5. A series of electronic device control devices](image)

**Caption:**
1. The LCD serves to display data from Bluetooth as a result of Arduino Uno
2. Trimpot functions as a tuning to sharpen the character and provide contrast on the LCD.
3. Resistor functions as a current divider, current limiter, voltage drop and voltage divider
4. Red LEDs function as indicators.
5. The transistor functions as the anchor of the circuit
6. Arduino as a microcontroller board
7. Bluetooth module as data sender
8. Relay as a switch (see Figure 6).

Figure 6. Design of electronic device control devices using smartphone-based voice identification

3.1 Test Results
After conducting the test, the data can be obtained as follows (see Table 1-3).

Table 1. Trial of Success

| No | Indicator of Success                                                                 | Success |
|----|---------------------------------------------------------------------------------------|---------|
|    |                                                                                        | Yes     |
| 1  | Can AMR Voice on a smartphone be connected to a device using Bluetooth?                | √       |
| 2  | Can AMR voice manage sound into data to Bluetooth?                                     | √       |
| 3  | Whether data sent via bluetooth can be processed by Arduino Uno?                       | √       |
| 4  | Is the LED on as an indicator of the success of electronic devices?                    | √       |

Table 2. Trial Activities of Electronic Devices Using Smartphone-Based Voice Identification

| No | Electronic Devices                                      | Test Results (Active) |
|----|--------------------------------------------------------|-----------------------|
|    |                                                        | Yes   | Not  |
| 1  | Lights 1                                               | √      |      |
| 2  | Lights 2                                               | √      |      |
| 3  | Fan                                                    | √      |      |
| 4  | Electronic devices are active simultaneously           | √      |      |
| 5  | Electronic devices die simultaneously                  | √      |      |
Table 3. Test the product using voice identification based on the coding program

| No | Voice Command Keyword       | Identified |
|----|----------------------------|------------|
|    |                            | Yes    | Not |
| 1  | Area technique             | √      |     |
| 2  | turn on the light 1        | √      |     |
| 3  | turn on the light 2        | √      |     |
| 4  | Turn off light 1           | √      |     |
| 5  | Turn off light 1           | √      |     |
| 6  | Turn on the fan            | √      |     |
| 7  | Turn off the fan           | √      |     |
| 8  | Turn on everything         | √      |     |
| 9  | Turn Off All               | √      |     |

3.2 Data Analysis:
Control of electronic devices using smartphone-based voice identification using AMR voice software to run the control system. Amr voice will be connected directly to Google Voice which causes Rx and Tx. Google voice then analyzes and translates data sent by Amr voice. After that, Amr voice processed the data sent by Google Voice into serial data and sent data to Arduino Uno to be processed and forwarded to the relay driver and output.

3.3 Product Revision
The product revision in this design is:
1. The use of transistors 517 and 9013 does not allow the flow of current. Therefore, the transistor used is transistor 548.
2. Using 1 voltage source (adapter) to supply Arduino 12 VDC is not possible because it is based on the results of the trial, that the voltage of 12 VDC for Arduino causes the IC regulator on Arduino to heat up and cause automatic arduino te restart. Excessive heat and lasts a long time (the product works for 24 hours) can cause Arduino to be damaged and restart automatically causing Arduino to not work perfectly. Therefore, the adapter for Arduino uses a 9 VDC voltage.

3.4 Study of Final Products
The main function of this tool is to turn on and turn off lights and fans and other electronic devices. This tool uses a smartphone that functions as a sound module to enter instructions using sound. The performance of this tool is inseparable from the role of Arduino Uno as a microcontroller board and Bluetooth module as a media for distributing data to Arduino Uno. The working principle of an electronic device control device using this smartphone-based voice identification, when we give instructions on a smartphone by saying the keywords that have been designed on the program, the electronic device will automatically execute the instructions. In this series using 5 relays that function as a switch that will turn on 2 lights and 1 fan while 2 other relays are additional if there are still electronic devices that want to be controlled.

4. Conclusion
The conclusion from the results of the design of electronic device control using smartphone-based voice identification is that
1. Electronic device control device using smartphone-based voice identification is divided into several parts, namely, Bluetooth module HC-05, Arduino Uno and relay.
2. Software used in this design is Amr voice software for coding programs in connecting smartphones with components in the device.
3. Electronic device control devices using smartphone-based voice identification aims to facilitate the control of electronic devices by using sound as an instruction provider and to prevent burglary on electronic devices. This product uses 5 pieces of relay as a switch to turn on/off 2 lights and 1 fan. While the other two relays are additional if there are still other electronic devices that we want to control.

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