

Designing a mosque charity box with voice recognition and GPS based on the internet of things

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ABSTRACT

A security system for mosque donation boxes has been designed and built with the goal of developing a tool that can identify mosque charity box theft using the Internet of Things. The ATmega328P and ESP-32 microcontrollers are the two used in this device. Additionally, a GPS module, speech recognition, and an HC-SR04 ultrasonic sensor are included with this tool. This demonstrated that the Neo-6M GPS Module was used quite accurately with a distance difference of about 3 m. The test results from the GPS on the mosque's donation box obtained latitude and longitude points of 3.492006 and 98.587856, respectively, while the coordinate points on Google Maps were 3.491760 and 98.587943. The HC-SR04 ultrasonic sensor's purpose is to track movement in the Afterwards, a buzzer or early-warning alarm will ring, and Wi-Fi will notify the telegram application of the coordinates. This tool also includes a pretty contemporary voice recognition-based system for opening and closing donation boxes, which can accurately record, recognize, and detect sound.

Keywords: Atmega328P; GPS; HC-SR04; internet of things; voice recognition

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INTRODUCTION

Every year many cases occur related to mosque charity boxes, including burglary and theft of charity boxes. In some cases of robbery, the thief not only took the money in the charity box but also took the charity box to destroy the evidence. Mosques that escape supervision are an opportunity for thieves to carry out their activities [1].

In general, every mosque still uses locks such as padlocks as a form of security for charity boxes, and the security system is said to be very adequate. Based on this, a charity box security system is needed which is equipped with an early warning system [2].

According to [3], the use of GPS technology is more effective in dealing with theft because it can find location coordinates with the help of the GPS module. The charity box locking and opening uses voice recognition instead of conventional keys such as padlocks, and there is an early warning alarm using a buzzer. This charity box is also based on the internet of

things using a telegram bot. The goal is that if the ultrasonic sensor detects movement from the charity box or the charity box is stolen, the system will send an automatic message to the telegram bot in the form of the coordinates of where the charity box is located.

Voice recognition is a voice recognition module and device that recognizes input in the form of sound given via a microphone on the voice recognition module. After the sound is input, it will be converted to a digital signal which will later be processed by the ESP 32 microcontroller as a basis for controlling information and processing the results (output) as a stage for interfacing commands to be executed [4].

RESEARCH METHODS

The research method used is an experimental method, namely, designing a mosque charity box with a safety or lock in the form of a servo motor equipped with a voice recognition module as a system for opening and

closing the mosque charity box. The brains of all components in this research are Arduino ATmega328 and ESP-32. Apart from that, this tool also uses the internet of things system, namely the Telegram application, where this Telegram application will later become a medium for providing information in the form of coordinates of mosque charity boxes. This can minimize cases of theft that occur. The following is a system or flowchart for designing a mosque charity box as in Figures 1 and 2.

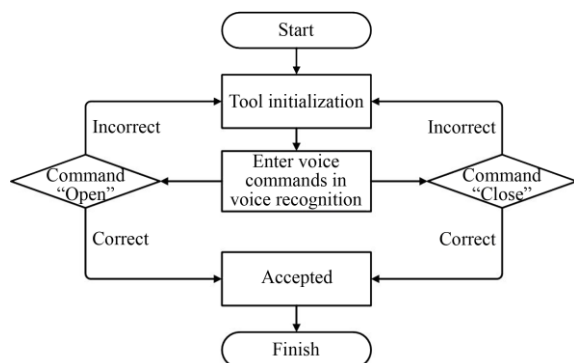


Figure 1. Flowchart of opening and closing the charity box.

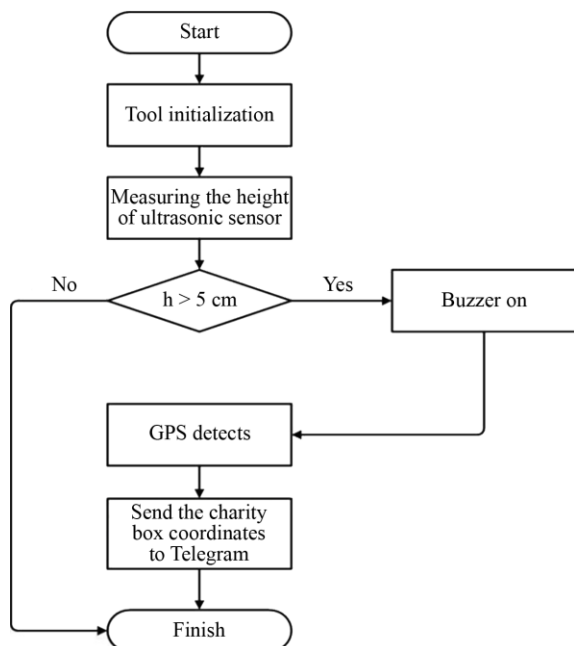


Figure 2. Telegram notification flowchart.

RESULTS AND DISCUSSION

The design of this mosque charity box uses acrylic material with dimensions of 30 cm long, 30 cm wide, and 30 cm high. Apart from that, there is a support or stand for this mosque's

charity box which is 15 cm high and 30 cm wide and is made of aluminium.



Figure 3. Mosque charity box design.

This mosque charity box uses two types of microcontrollers, namely, ATmega328P and ESP-32. The sensor used is the HC-SR04 ultrasonic sensor.

Adapter Test Results

Table 1. Adapter test results.

Adapter (V_{in}) (Volt)	Stepdown output (V_{out}) (Volt)
12.67	4.94

In testing the voltage or adapter, the input voltage on the adapter (V_{in}) which was tested with a multimeter was 12.67 V and the output voltage (V_{out}) after going through the stepdown was 4.94 V. Stepdown here functions to reduce the output voltage or output from the power supply, before going through the stepdown, the output value is 5 V. The test results mean that the resulting voltage is safe to use and stable for all tool component systems and does not damage the tool components.

Voice Recognition Test Results

Based on the table above, it can be concluded that the voice that has been input to

the system in the voice recognition module can open and close the charity box with an index or symbol in programming marked with 0 and 1 for BKM 1 users, and an index of 3, 4 for BKM 2 users. Meanwhile, voice those not entered into the system will be rejected or will not be able to open the mosque charity box.

The system for opening and closing mosque charity boxes uses sound indicators recorded by the voice recognition module. Only registered voices can open and close the mosque's charity box. The working system is that when the quote display has finished running, the user says the keyword "Open" right into the voice recognition mic, when the keyword is pronounced it is required to be in silence. So that the module can process sound properly, if sound has been detected then the lid of the charity box will open. Meanwhile, the closing process is not much different from when you want to open the lid of the charity box, namely

by saying the keyword "Close" if successful, it will immediately close.

Table 2. Voice recognition test results.

User	Command	Result	Index
BKM 1	"Open"	Accepted	0
	"Close"	Accepted	1
BKM 2	"Open"	Accepted	3
	"Close"	Accepted	4
Foreigners	"Open"	Rejected	-
	"Close"	Rejected	-

GPS Module Test Results

In Table 3 it can be seen that the location of the latitude point on Google Maps is 3.492006, while the latitude point on the Neo-6M GPS module is 3.491760. Then the longitude points of the mosque charity box on Google Maps and the GPS-Neo 6M module are 98.587856 and 98.587943 respectively. Both have quite accurate accuracy with a distance difference of approximately 3 meters.

Table 3. Google Maps coordinates and neo-6M GPS module.

Maps		GPS module		S
Latitude	Longitude	Latitude	Longitude	(m)
3.492006	98.587856	3.491760	98.587943	± 3

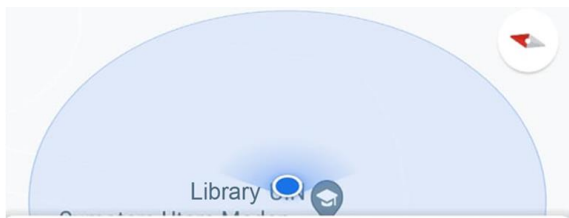


Figure 4. Coordinate points on Google Maps.

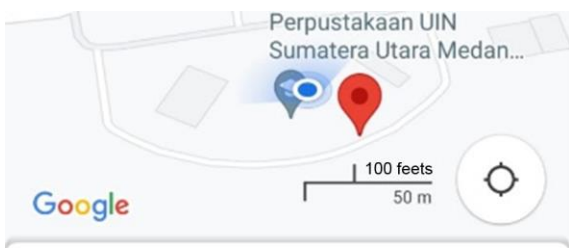


Figure 5. Coordinate points on GPS.

Servo Motor test results

In this research, a servo motor was used to open and close the charity box door. If voice command is successful, the servo motor will open 180°. The same thing also applies when you want to close the mosque's charity box, namely saying the exact command word into mic of voice recognition module. If successful, the servo motor will close and move 90°.

Table 4. Servo motor testing.

Servo location	Open door (°)	Close door (°)
Front	180	90
Behind	90	180

Telegram Test Results

The way it works is that if there is movement or shifting of the charity box as high

as 5 cm, the ultrasonic sensor will detect it and the GPS will automatically send information or notifications to Telegram repeatedly or what could be called spam. At the same time, the buzzer will also ring as a form of early warning alarm.



Figure 6. Telegram notification test result.

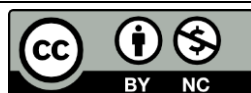
CONCLUSION

Mosque charity box security using Voice Recognition works in a way where the system will recognize the voice and commands that have been set in the program, the voice that has been input into the program will be detected and can open and close the door of the mosque charity box and vice versa if the voice is not recognized or not. registered then cannot open the mosque charity box. The Neo-6m GPS module which has been installed in the mosque's charity box will automatically store information regarding coordinate points, and if movement occurs, the Wi-Fi system on the ESP-32 will automatically send the longitude and latitude points to the Telegram application continuously or spam. Ultrasonic sensors play an important role in detecting theft because if the charity box moves at a height of more than 5 cm from a distance, the ultrasonic sensor

detects it and the buzzer will sound as a form of early warning alarm, then send a notification to Telegram.

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