Emergency System for the Elderly Based on Sound Sensor with Telegram Bot Notification and Voice Alarm

Samrotun Nabila[1], Amalia Eka Rakhmania[2*], Muhammad Syirajuddin Suja'i[3]

[1]Digital Telecommunication Network Study Program, Department of Electrical Engineering, State Polytechnic of Malang, 65141, Indonesia.
[2,3]Telecommunication Engineering Study Program, Department of Electrical Engineering, State Polytechnic of Malang, 65141, Indonesia.

[1]samrotunnabila02@gmail.com, [2]amaliaeka.rakhmania@polinema.ac.id, [3]syirajuddin@polinema.ac.id

***Abstract*— According to data from the Central Statistics Agency, in 2022, the percentage of the elderly population in Indonesia is 10.48%. In emergencies, such as accidents or sudden illness, the elderly often find it difficult to ask for help because of the physical and cognitive limitations they experience. The recommended distance to perform voice commands is 5cm. Testing of sound sensors performed by children's age was unsuccessful. The system can be used in occasional conditions such as pressing the panic button and giving voice commands, can last 1 hour 25 minutes up to a threshold of 20% in a voltage of 6.49V until the battery runs out the system can be used for 1 hour 36 minutes, while in idle conditions the system can be used for 1 hour 28 minutes to a threshold of 20% in a voltage of 6.49V until the battery runs out at a voltage of 611V the system can be used for 1 hour 38 minutes. Connecting the prototype with telegram as a remote notification shows that the system successfully sent messages to telegram 100% in real-time. A full battery charge of 7,11V and the battery threshold of 20% discharge at 6,49V for a completely discharged battery at 6,11V.**

Keywords*— Emergency Elderly, IoT, Sound Sensor, Telegram, Voice Alarm.

I. INTRODUCTION

Indonesia is currently experiencing a significant increase in the number of elderly population. In 2022, the percentage of the elderly population in Indonesia is 10.48%. This figure decreased by 0.34% compared to the previous year reaching 10.82%.

"Elderly Population are those who have reached the age of 60 years and over. The majority of the population in Indonesia Province is the elderly population and eight other provinces have a percentage of the elderly population that exceeds 10%. Among them, Yogyakarta Province with the highest percentage of elderly population is 16.69%. East Java, Bali and Central Java followed with a percentage of around 13% [1]. In emergencies, such as accidents or sudden illness, the elderly often find it difficult to ask for help because of the physical and cognitive limitations they experience. Therefore, an emergency system is needed that can help the elderly in emergency situations.

There are several challenges in developing emergency systems for the elderly. First, the elderly have physical and cognitive limitations that can affect their ability to use technology. Second, the system must be able to recognize the voice of the elderly with high accuracy to ensure that requests for help can be received quickly and precisely. Third, the system must be easy to use and easily accessible to the elderly. Cognitive refers to the process of understanding, processing, and storing information in the human mind.

Authors in [2] discusses the development of a robot that can be controlled by voice through the use of telemetry sensors and voice pattern recognition technology. This system utilizes EasyVR and GSM cell phones to transmit voice data wirelessly over long distances. The design of this system is based on the use of an Arduino Uno microcontroller and is equipped with an LCD screen. With voice pattern recognition technology integrated in this system, users can give instructions to the robot via spoken voice. The robot will recognize the sound pattern and carry out the appropriate commands. The weakness of this research is the lack of a detailed explanation of how the recognition system and telemetry sensors work technically. Suggestions for further research can correct the shortcomings of previous research and improve the problem of ambient noise.

Authors in [3] discusses the development of a smart lock application for house doors using IoT-based Arduino and sound sensors. The aim of this research is to improve home security by replacing conventional locks with a smart lock system that can be accessed via the internet network. In this research, the author uses a sound sensor as one of the main components in the smart lock system. Sound sensors are used to recognize the home owner's voice and open the door automatically. Apart from that, this system is also equipped with an access time setting feature, so that homeowners can set access times for certain people. The test results show that the smart lock system developed can function well and can be accessed via the internet network. The weakness of this

*Corresponding author

research is the sensitivity of the sound sensor, so the researcher suggests that further research can increase the sensitivity of the sound sensor.

Authors in [4] discusses the development of voice recognition in automatic dispensers to make it easier for blind people to collect drinking water. The system uses a V3 voice recognition module, Arduino R3 microcontroller, ultrasonic sensor, water flow sensor and servo motor. The voice recognition system works when the ultrasonic sensor detects the glass in each tap with a maximum detection distance of 5 cm. The limitations of this study for blind individuals are not explicitly stated in the information provided. Therefore, it cannot be specifically stated as to the shortcomings in the research. Suggestions for further research could explore the usefulness and effectiveness of voice recognition systems in automatic dispensers for blind individuals.

Authors in [5] discusses the development of a smart home system using Easy Voice Recognition and Internet of Things (IoT) technology. This system allows users to control and monitor electronic devices in their home using voice commands and the Blynk app on their smartphone. This system uses an Arduino Uno as a controller and an EasyVR 3 module for voice recognition. EasyVR's success rate in recognizing recorded voices was 88.75%, while the success rate for other voices was 20%. The system also uses the WeMos D1 for wireless control and monitoring. The shortcomings of this research are testing with limited sound samples and the influence of a noisy environment. Suggestions for further research, exploring the use of algorithms to improve the system in recognizing new voices and accents.

Authors in [6] discusses the design of a cupboard locking system using voice recognition technology. This system uses voice commands to open and lock cupboard doors and is designed using an electronic voice recognition module, an Arduino Uno R3 microcontroller, a servo motor, and LED lights. This article also discusses previous research on voice recognition technology for security systems. Suggestions for further research are to carry out tests with various types of voice recognition modules and servo motors to obtain better results. In addition, research can be carried out by considering different environmental factors, such as noise and distance between the user and the locking system.

The development of emergency systems for the elderly based on voice sensors using the V3.1 voice recognition module sensor has high relevance in today's industry. With the increasing number of elderly in Indonesia, technological solutions are needed that can help them in emergency situations. In addition, the use of voice sensor technology that has a pattern recognition feature can help increase accuracy and speed in processing requests for help from the elderly. This can help reduce response times and improve the safety and well-being of the elderly.

Based on this, the idea was created to create a prototype which can help an elderly person to get security anywhere with the help of voice detection help or the use of help buttons if something happens to the elderly connected to the buzzer and interface as a remote notification. By using Telegram Bot can provide emergency message notifications to the family to notify about emergency situations that are happening. So, this research wants to create an innovation entitled "Emergency System for the Elderly Based on Sound Sensors with Telegram Bot Notifications and Sound Alarms".

II. METHOD

A. Block Diagram

Based on Figure 1 there are INPUT, PROCESS and OUTPUT. at INPUT there is a Voice Recognition Module V3 as a voice module which can later detect voice commands that have been trained and stored in the module, a panic button if the voice recognition module cannot detect while there is an emergency then it can use a panic button as a help button, a voltage sensor to detect the voltage on the system battery which can later provide an indicator when the system battery will run out. in the Process section for the voice recognition module V3 is connected to the Pro Mini because the module has a library that can only be connected from the pro mini to be able to provide an indicator when the system battery will run out. in the Process section for the voice recognition module V3 is connected to the Pro Mini because the module has a library that can only be connected to the arduino microcontroller and for the ESP32 as the main microcontroller that connects from the pro mini to be detected by telegram if the sound is detected. because ESP32 can connect to the internet network while the pro mini does not have access to the internet. while at OUTPUT ther is an LED as an indicator of the system when connected to the internet, Buzzer when the system detects commands from the voice sensor or panic button after that gives a message to telegram.

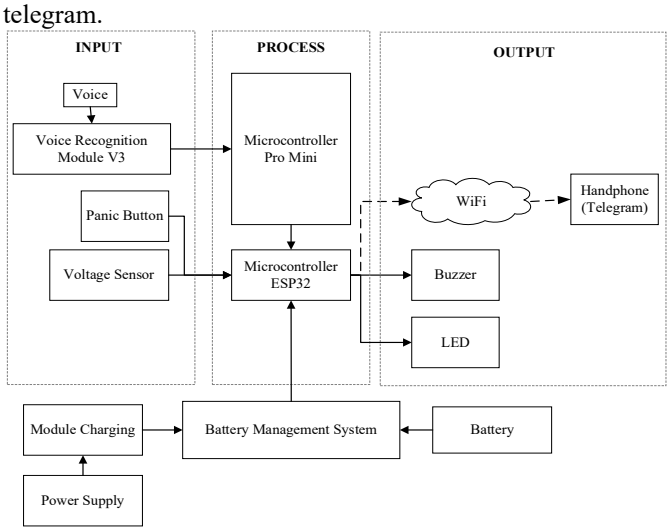


Figure 1. System Block Diagram

1. Arduino Pro Mini

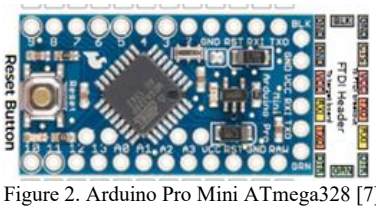


Figure 2. Arduino Pro Mini ATmega328 [7]

Arduino Pro Mini is a microcontroller board with ATmega328. It has 14 digital input/output pins (of which 6 pins can be used as PWM output), 6 analog inputs, an on-board resonator, a reset button, and a hole for installing header pins. The six-pin header can be connected to an FTDI cable or Sparkfun board breakout to provide USB power and communications for the board. The Arduino Pro Mini is intended for semi-permanent installation on an object, with the Pro Mini allowing the use of various types of connectors or direct soldering of cable pin layouts compatible with the Arduino Mini. There are 2 versions of the Pro Mini, the Pro Mini which runs at 3.3V and 8MHz, and the one at 5V and 16MHz. Arduino Pro Mini is manufactured by Sparkfun Electronics [8].

2. ESP32

Figure 3. Nodemcu ESP32 Microcontroller [9]

ESP32 is a microcontroller introduced by the Espressif System lineage of the ESP8266 microcontroller [8]. The WLAN module is available on this microcontroller on a chip, so it makes a very powerful application system. These pins can be used as input or output to turn on the LCD, lights, and even to drive a DC motor.

ESP32 is a microcontroller developed by the Chinese company, Espressif Systems. The ESP32 uses a Tensilica Xtensa LX6 microprocessor, can be used in single-core or dual-core mode. The ESP32 is the successor to the ESP8266 which is quite popular for IoT applications, the ESP32 has a fairly fast CPU and Wi-Fi and supports two-mode Bluetooth with low power [10].

3. Voice Recognition Module V3.1

Figure 4. Voice Recognition Module V3.1 [11]

ELECHOUSE Voice Recognition Module is a compact and easy to control voice recognition board. Voice recognition module* V3 is a voice module used to recognize human voices and convert them into digital data format. The VR module V3 is designed for use with external speakers. This module can store up to 80 voice commands, and can simultaneously detect up to 7 voice commands simultaneously [12]. The types of commands that can be used are very varied and easy to train through simple algorithms.

This sensor can recognize and interpret human speech. These sensors are commonly used in various applications such as home automation, robotics, and assistive technology for people with disabilities. The working principle of this sensor is to detect sound waves and convert them into electrical signals which are processed by a microcontroller. This sensor is equipped with a built-in amplifier that amplifies sound signals and filters out noise. This sensor uses a speech recognition algorithm to analyze sound signals and identify spoken words. This algorithm compares sound signals with a predetermined set of words.

4. Voltage Sensor

Figure 5. Voltage Sensor [13]

A voltage sensor is a device or module used to measure, monitor and calculate the size of the voltage supply in an electronic circuit [14]. Apart from that, this sensor can also be used to detect and measure AC or DC voltage according to its features and capabilities.

The working principle of the voltage sensor module for measuring voltage is based on the principle of resistance suppression, and can reduce the input voltage by up to 5 times the original voltage. This means that the voltage sensor module has a voltage divider circuit. This circuit is very useful when the module is connected to the Arduino Uno to read the voltage measured by the sensor. The voltage divider circuit will ensure that the voltage from the incoming sensor matches the Arduino Uno specification range, namely 0 – 5V.

5. Buzzer

Figure 6. Buzzer [15]

A buzzer is a sensor that produces sound in a system with a working principle based on the movement of a magnet in a piezoelectric element. When voltage is applied to the element, the magnet vibrates and produces sound. The sound frequency of the buzzer depends on the signal sent to the piezoelectric element [16].

6. Push Button

Figure 7. Push Button [17]

Push button is a sensor used to detect buttons being pressed on a device. This sensor works by opening and closing the electrical contacts on the button. When the button is pressed, the electrical contacts close and an electric current flows. When the button is released, the electrical contacts open and stop the flow of electric current. Apart from being a component for turning on and off electronic devices, the switch also functions as a controller to activate features in the electrical circuit according to the program used [18].

7. Telegram

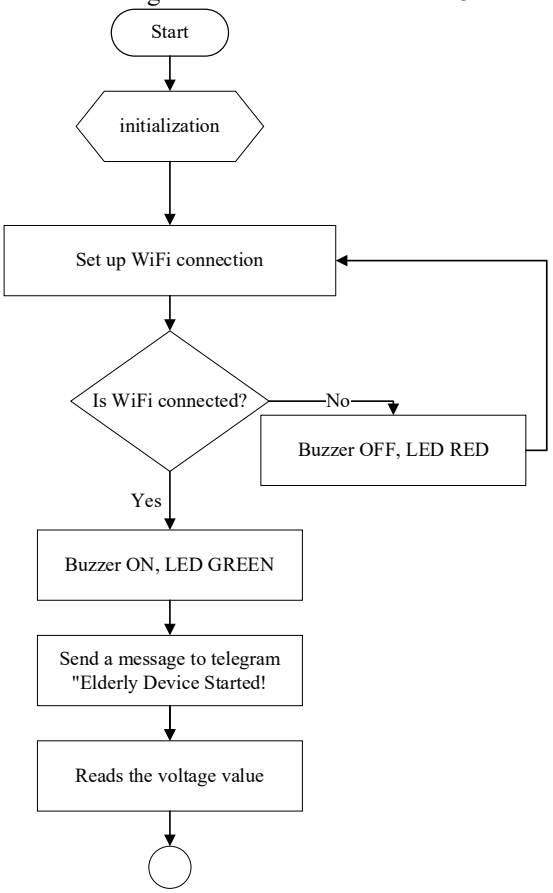
Telegram is a cloud-based instant messaging service application. The advantage of using Telegram is that it can accommodate many members in a group. In the Telegram application there is a bot, the Telegram Bot Application Programming Interface (API) is an open source technology provided by Telegram Messenger LLP to build Telegram applications for developers. Bot API is an HTTP-based interface for connecting bots developed by developers with the system [19].

8. Battery

A battery is a device that produces electrical energy through a chemical reaction between two chemicals in battery cells. There are various types of batteries, including fused batteries (alkaline, lithium), rechargeable batteries (NiMH, NiCd), and lithium-lion batteries (Li-ion). Each type of battery has different characteristics in terms of capacity, voltage and recharge cycles. Almost all portable electronic devices such as cellphones, laptops and remote control toys use batteries as their power source. With a battery, there is no need to connect an electrical cable to the terminal to activate electronic devices, so it can be easily carried anywhere [20].

Each battery consists of a positive terminal (cathode) and a negative terminal (anode) as well as an electrolyte which functions as a conductor. The electraa ic current output from the battery is direct current or called DC (Direct Current). The battery that the author will use is a rechargeable battery (lithium polymer).

9. Flowchart Algoritmh Microcontroller ESP32



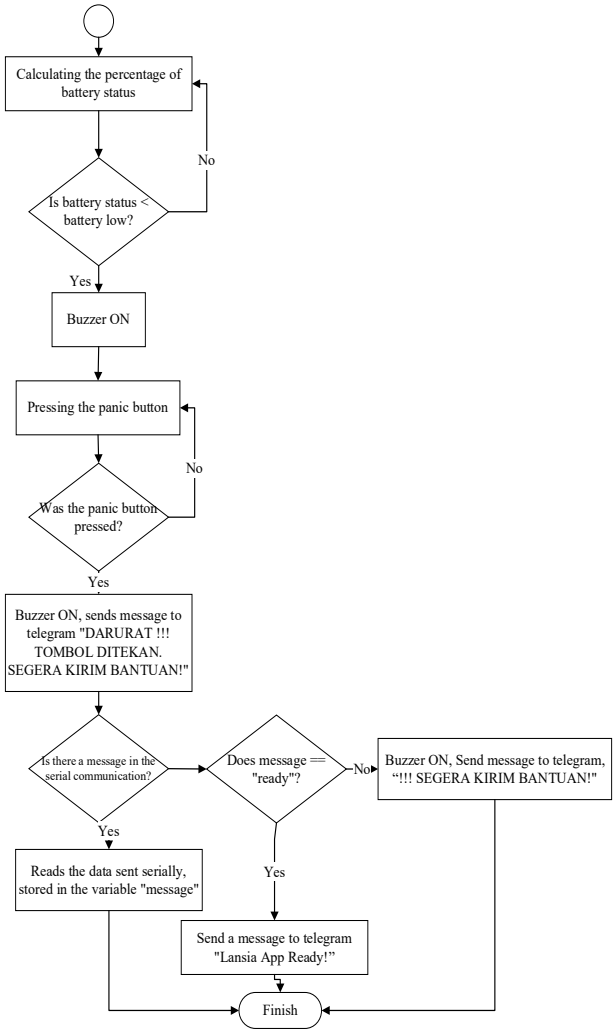
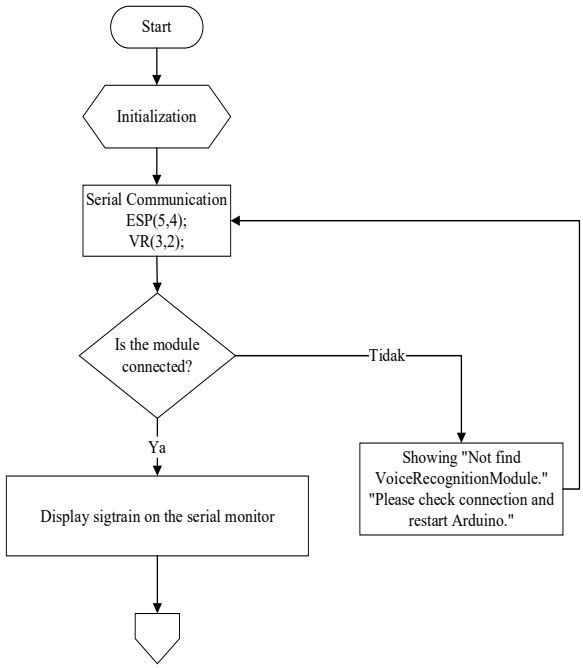


Figure 8. Flowchart Algoritmh Microcontroller ESP32

B. Flowchart Algoritmh Microcontroller Pro Mini



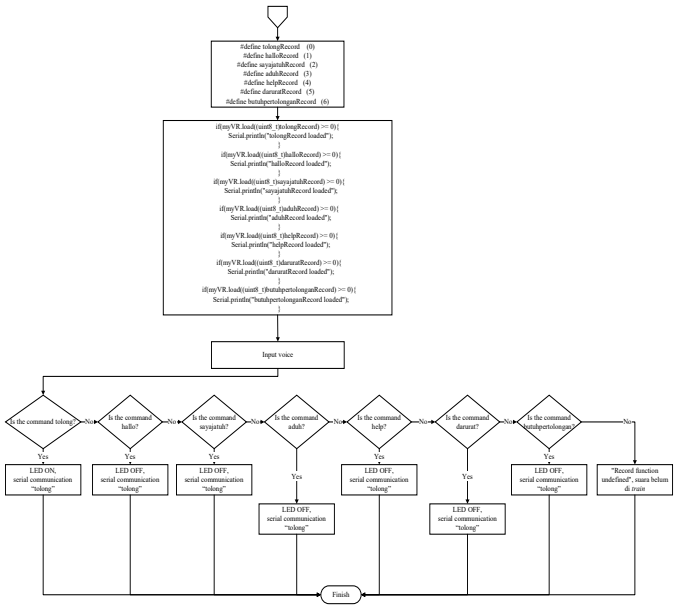


Figure 9. Flowchart Algoritmh Microcontroller Pro Mini

C. *Sound Recording Process Flowchart*

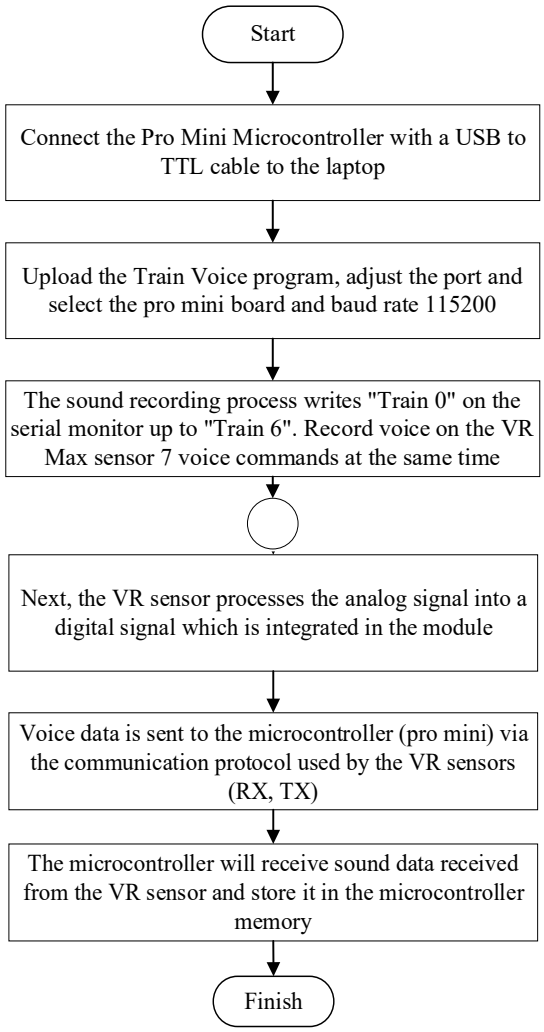


Figure 10. Sound Recording Process Flowchart

D. *Sound Storage Process Flow Diagram*

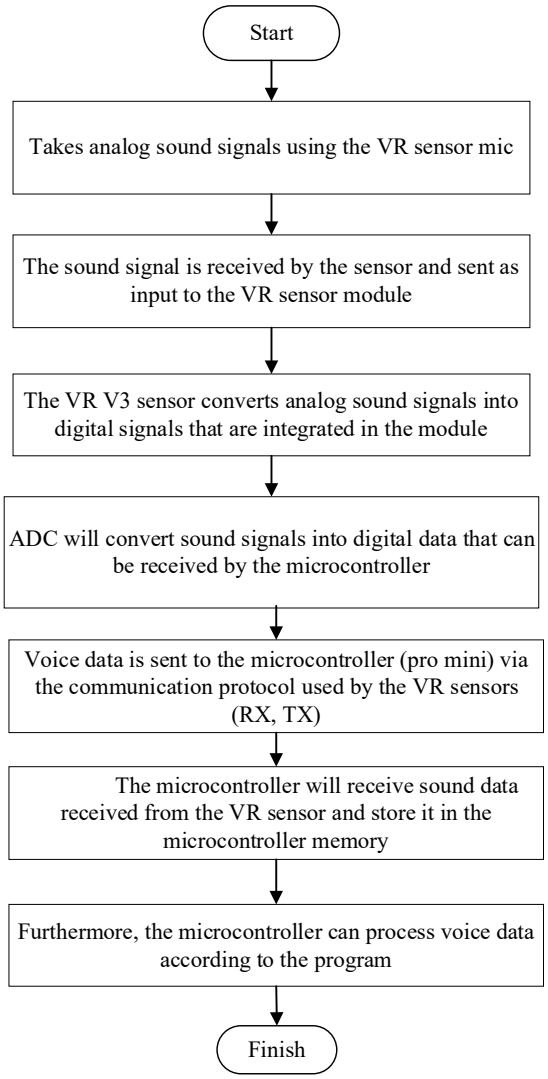


Figure 11. Sound Storage Process Flowchart

III. RESULTS AND DISCUSSION

A. *Training Voice*

Using the Arduino IDE application, a voice training process is used to register voice commands to the voice sensor module. The experiment is carried out by repeating the word to be trained. For voice recording, use the "train" command to give commands such as "Help, Hello, I Fell, Ouch, Help, Emergency, and Need Help", as shown in Figure 12 and Figure 13.

The training process involved data from various genders, including women and men. The purpose of engaging both sexes is to ensure that the module can recognize and understand voices or data from both sexes with good accuracy. Differences in voice characteristics between females and males can affect speech processing and recognition. Therefore, involving data from both sexes in the training process can help the module to study and understand voice variations that occur between women and men.

Table 1 and Table 2 show the processing time duration of each command entered in the training process from input to voice command detection.

```
06:31:51.076 -> ------------------------------------------------------------
06:32:01.076 -> train 0
06:32:01.076 -> ------------------------------------------------------------
06:32:02.571 -> Record: 0       Speak now
06:32:05.825 -> Record: 0       Speak again
06:32:07.104 -> Record: 0       Cann't matched
06:32:08.592 -> Record: 0       Speak now
06:32:11.858 -> Record: 0       Speak again
06:32:14.528 -> Record: 0       Success
06:32:14.528 -> Train success: 1
06:32:14.528 -> Record 0        Trained
06:32:14.528 -> ------------------------------------------------------------
06:32:29.375 -> train 1
06:32:29.375 -> ------------------------------------------------------------
06:32:30.877 -> Record: 1       Speak now
06:32:34.125 -> Record: 1       Speak again
06:32:35.349 -> Record: 1       Too noisy
06:32:36.878 -> Record: 1       Speak now
```

Figure 12. Training Voice Women

TABLE I
WOMEN VOICE TRAINING PROCESS

Command	Description	Duration (s)
Tolong	Succeed	14
Hallo	Succeed	12
Saya Jatuh	Succeed	06
Aduh	Succeed	06
Help	Succeed	06
Darurat	Succeed	06
Butuh Pertolongan	Succeed	42

```
16:04:46.435 -> Record: 0       Success
16:04:46.435 -> Train success: 1
16:04:46.435 -> Record 0        Trained
16:04:46.435 -> ------------------------------------------------------------
16:05:06.956 -> train 1
16:05:06.956 -> ------------------------------------------------------------
16:05:08.438 -> Record: 1       Speak now
16:05:11.726 -> Record: 1       Speak again
16:05:12.928 -> Record: 1       Cann't matched
16:05:14.473 -> Record: 1       Speak now
16:05:17.748 -> Record: 1       Speak again
16:05:18.965 -> Record: 1       Cann't matched
16:05:20.478 -> Record: 1       Speak now
16:05:23.768 -> Record: 1       Speak again
16:05:24.967 -> Record: 1       Cann't matched
16:05:26.529 -> Record: 1       Speak now
16:05:29.806 -> Record: 1       Speak again
16:05:31.014 -> Record: 1       Cann't matched
16:05:32.532 -> Record: 1       Speak now
16:05:35.844 -> Record: 1       Speak again
16:05:37.046 -> Record: 1       Cann't matched
16:05:38.573 -> Record: 1       Speak now
16:05:41.864 -> Record: 1       Speak again
16:05:43.068 -> Record: 1       Cann't matched
```

Figure 13. Training Voice Men

TABLE II
MEN VOICE TRAINING PROCESS

Command	Description	Duration (s)
Tolong	Succeed	24
Hallo	Succeed	46
Saya Jatuh	Succeed	19
Aduh	Succeed	24
Help	Succeed	43
Darurat	Succeed	14
Butuh Pertolongan	Succeed	17

B. Testing the distance of the Voice Recognition Module V3.1 sensor to communication

This test is carried out by entering the recorded word commands, namely female voice and male voice. This is done on the system test at point 1. In the test, four human voices were used as samples, with the categories "female 1" as female voice trainer and "male 1" as male voice trainer. Then, the voices of other women and men were tested to see if they matched the voice trains performed by the "female 1" and "male 1" categories. System testing was also conducted with the voices of 8-year-olds who were male.

1) Test the voice recognition sensor systemTest System Women Command Please

TABLE III
WOMEN COMMAND PLEASE

System test sound type	Word Command	Testing To-	Distance (cm)	Indicator Buzzer	Notifications Telegram
Female 1	Tolong	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Female	Tolong	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Male 1 1	Tolong	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Male	Tolong	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Female 1	Halo	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Female	Halo	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Male 1	Halo	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Male	Halo	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Female 1	Saya Jatuh	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Female	Saya Jatuh	1	5	ON	Succed
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
Male 1	Saya Jatuh	1	5	ON	Succed

System test sound type	Word Command	Testing To-	Distance (cm)	Indicator Buzzer	Notifications Telegram
		2	15	ON	Succed
		3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male	Saya Jatuh	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female 1	Aduh	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female	Aduh	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male 1	Aduh	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Berhasil
		2	15	ON	Succed
Male	Aduh	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female 1	Help	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female	Help	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male 1	Help	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male	Help	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female 1	Darurat	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female	Darurat	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male 1	Darurat	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male	Darurat	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female 1	Butuh Pertolongan	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Female	Butuh Pertolongan	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male 1	Butuh Pertolongan	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful
		1	5	ON	Succed
		2	15	ON	Succed
Male	Butuh Pertolongan	3	25	ON	Succed
		4	35	ON	Succed
		5	45	OFF	Unsuccessful

2) Test the system with the "Gawat" command, in addition to the specified 7 word commands

TABLE IV
TEST THE SYSTEM WITH COMMANDS OTHER THAN THE SPECIFIED WORD COMMAND

Jenis suara uji sistem	Pengujian	Jarak (cm)	Indikator Buzzer	Notifikasi Telegram
	1	5	OFF	Unsuccessful
	2	15	OFF	Unsuccessful
Female 1	3	25	OFF	Unsuccessful
	4	35	OFF	Unsuccessful
	5	45	OFF	Unsuccessful
	1	5	OFF	Unsuccessful
	2	15	OFF	Unsuccessful
Female	3	25	OFF	Unsuccessful
	4	35	OFF	Unsuccessful
	5	45	OFF	Unsuccessful
	1	5	OFF	Unsuccessful
	2	15	OFF	Unsuccessful
Male 1	3	25	OFF	Unsuccessful
	4	35	OFF	Unsuccessful
	5	45	OFF	Unsuccessful
	1	5	OFF	Unsuccessful
	2	15	OFF	Unsuccessful
Male	3	25	OFF	Unsuccessful
	4	35	OFF	Unsuccessful
	5	45	OFF	Unsuccessful

Based on the test results in Table 3, the vr sensor does not have a specified maximum distance, but the authors recommend the best distance for a sound detecting system is a distance of 5cm. The system can effectively detect sound up to a maximum distance of about 35cm. However, at a distance of 45cm, the system cannot detect the sound being sent.

So, the best distance to get optimal sound detection results is 5cm to 35cm. Distances outside that range the system does not respond. In tests with voice commands other than those that have been processed training, the system cannot respond or does not succeed.

3) Runtime testing Test the system with a distance of 5 cm with emergency voice command and I fell

TABLE V
TEST THE DURATION OF THE VOICE COMMAND PROCESS WITH A DISTANCE OF 5 CM

Word Command	Category	Indicator Buzzer	Notification Telegram	Word Recognition Duration
Darurat	Female 1	ON	Succed	03 second
	Female	ON	Succed	04 second
	Male 1	OFF	Succed	07 second
	Male	ON	Succed	10 second
Saya Jatuh	Female 1	ON	Succed	03 second
	Female	ON	Succed	11 second
	Male 1	ON	Succed	17 second
	Male	ON	Succed	17 second

4) Test the system with word commands performed by children

TABLE VI
VOICE COMMAND TESTING BY CHILDREN

Testing	Word Command	Level of success
1	Tolong	Unsuccessful
2	Hallo	Unsuccessful
3	Saya Jatuh	Unsuccessful
4	Aduh	Unsuccessful
5	Help	Unsuccessful
6	Darurat	Unsuccessful
7	Butuh Pertolongan	Unsuccessful

C. *Battery Life Test Results*

Elderly emergency hardware uses 10 batteries with 1 battery having a full battery voltage of 4,2V and a discharge battery voltage of 3V, For the use of the entire system with 10 batteries full voltage 8,4V and empty voltage 6V by connecting two batteries in series (2s), so as to produce a total voltage of 2 batteries, and connected in parallel with other series batteries to get a large battery capacity. Below to get the percentage value of the battery by using a dc voltage sensor and the threshold of discharged battery status is used 20% at a voltage of 6,49 V.

1) Battery testing when the appliance is in use

In this test, it has conducted a series of tests to test battery life when the device is used with voice commands and panic buttons pressed, when the battery is full, the system can be used for 1 hour 25 minutes by occasionally doing voice commands and pressing the panic button as in Table 8, battery life lasts until the battery reaches 20% in 6,49V voltage, where the appliance can still function properly for 11 minutes until the battery is completely discharged at 6,15V.

TABLE VII
BATTERY TESTING WITH VOICE COMMAND SYSTEM AND PANIC BUTTON PRESSED

Voltage	Time
7,11 V	18:15 WIB
7,02 V	18:29 WIB
6,95 V	18:41 WIB
6,83 V	19:08 WIB
6,73 V	19:21 WIB
6,66 V	19:28 WIB
6,59 V	20:38 WIB
6,54 V	20:41 WIB
6,49 V	20:44 WIB
6,29 V	20:53 WIB
6,15V	20:53 WIB

2) Idle position battery testing

The results of the battery life test in the idle position are shown in Table 9 that the system can be used for 1 hour 38 minutes, In addition, the system can also last for 1 hour 28 minutes when it is in the idle position up to 20% in 6.49V voltage and can still be used for an additional 10 minutes until the battery is completely discharged at 6.15V voltage.

TABLE VIII
BATTERY TESTING WITH IDLE SYSTEM

Voltage	Time
7,17 V	13:53 WIB
7,02 V	14:11 WIB
6,89 V	14:37 WIB
6,82 V	14:54 WIB
6,68 V	15:08 WIB
6,59 V	15:15 WIB
6,49 V	15:21 WIB
6,28 V	15:31 WIB
6,15 V	15:32 WIB

D. *Hardware Implementation*

Figure 14. Implementasi Hardware System Emergency

E. *Telegram Implementation*

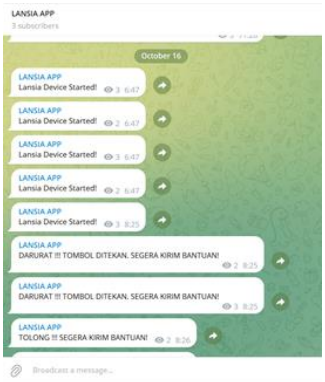


Figure 15. Telegram Message Notification

Message "Elderly Device Started!" when the system is successfully connected to the internet network. message "EMERGENCY!! BUTTON PRESSED. SEND HELP IMMEDIATELY! when the panic button is pressed by the elderly in an emergency and option when the sound sensor cannot be used. message "HELP!!! IMMEDIATELY SEND HELP!" when the system detects a word command sent via voice sensor.

IV. CONCLUSION

The voice sensor-based elderly emergency system can be used when the voice command matches the word that has been stored in the system. In Telegram, there is a notification TOLONG!!! SEGERA KIRIM BANTUAN!" for word commands, and "DARURAT!!! TOMBOL DITEKAN, SEGERA KIRIM BANTUAN!!" if the panic button is pressed. Testing using male and female voice systems with a success rate of 80%, the system successfully detects male and female voices at a distance of 5cm, 15cm, 25cm and 35cm, but at a distance of 45 cm the system cannot detect voices. Connecting the emergency system prototype with Telegram as a remote notification using Telegram Bot API so that it can send real-time notifications when an emergency situation is detected. The test results show that 100% successfully sent to telegram. The voice recognition module V3.1 sensor can detect within a distance of 5-35 cm with differences in female and male gender voices, according to the voice that has been trained on the command word.

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