International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 05 | May 2022 www.irjet.net p-ISSN: 2395-0072

Smart Elevator

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Abstract - *The paper proposes a voice recognition system that is implemented in an elevator. Our goal is to create a touchless elevator that can recognize voice instructions and carry out tasks in response to them. This project is highly beneficial for physically disabled people, like blind and handicapped people. Also, in a global health crisis like COVID-19, touching anything in a public place is highly contagious. A smart elevator is going to help there. This is a fully automated system with touchless features. A person does not need to touch any button to operate the lift. The proposed system works for five floors of a college building and accepts voice input commands for floor numbers and ON/OFF operations for lights and fans. This is an interactive system that also gives voice outputs to make it more user-friendly. This system uses the Python programming language and machine learning libraries on the Raspberry Pi 3B+.*

***Key Words*: speech recognition, voice recognition, Raspberry Pi 3B+, machine learning, touchless elevator, embedded systems, Internet of things.**

1. INTRODUCTION

In this rapid world of technology where a voice begins, its era of domination to replace the touch screens from smartphones to huge computer systems, bringing voice into day-to-day life becomes significant. Elevators, being one such system used in daily life, serve the purpose of making future generations hands-free, which also becomes a boon for the disabled.

With the increase of high-rise buildings, there has been an increasing demand for elevator systems. It is used daily as a transport device for people as well as for moving goods. "An elevator is a very handy equipment that transports people to the required floor in the quickest period." An elevator is an exceedingly useful device that moves individuals in the shortest amount of time to the required floor.

We will see a massive diversity of home complexes crammed into procurable places with multi-storage building capabilities in today's life. "This project is more suitable for blind, unfit, and physically challenged people. trying to reach the current scenario of COVID-19. Manually operated elevators have a high rate of virus transmission. The main reason for choosing this method is that it allows you to control your elevator using voice commands. Speech recognition systems are a crucial part of the project. The speech recognition of the elevator system permits the communication mechanism between the user and also the Arduino primarily based mechanism.

The elevator is difficult to use for the blind. It is difficult to use the keypad if they cannot see it. Sometimes the keypad has Braille technique, but they will have a hard time locating it. Even though they found the keypad, how could they know the number if they don't know Braille? The struggle of blind people using elevators is real. They constantly need someone to press the button for them and alert them when the elevator cabin arrives in elevators. They also have trouble determining if the elevator door is opening or shutting. Not only that but in case of an emergency, how will they act if there is no one with them to help?

For a variety of reasons, the voice control option is appealing. Because the system can be utilized by anyone capable of constant and identifiable vocalization, it may be appropriate for a significant number of elevator users. Voice control also reduces physical requirements. However, the recognition accuracy of automatic speech recognition (ASR) systems is a constraint in the deployment of many voice-controlled systems in real-world applications.

1.1 Problem defination

Looking towards the current situation of COVID-19, manually operated lifts have a high rate of spreading the virus as they make contact with each other while manually operating them. Also, for the handicapped person to operate the lift manually, it will not be possible. So, to overcome this major drawback, voice-controlled elevators can be a very good option. Physically disabled people are not able to operate elevators normally. They need some solution.

1.2 Scope

This device is very helpful for blind and physically challenged people. The speech recognition system serves as a conduit for communication between the user and the Raspberry Pi-based lift control system. This system acts as a human-machine communication system. The speech recognition model is the way of controlling the elevator. Speech recognition is the process of recognizing spoken words to take the necessary actions accordingly. The user provides vocal commands as input, and the controller determines whether the instruction is to raise upwards or downwards, and according to the user's voice," says the researcher. The switching mechanism controls the lift.

During a COVID pandemic, it's better to take safety measures. Most of the disadvantages of manual systems can be eliminated by our proposed approach.

2. PROPOSED SYSTEM

The goal of this project is to create an elevator model that responds to voice input as seamlessly as a real elevator model. A powerful processing system, in this case, the Raspberry Pi 3 microcontroller, is expected for this function. We aimed at having both the hardware and the software as modular as possible, to ensure that any future ideas can be inculcated into the same project effectively and easily.

Speech is the best and ideal method to control the elevator. The system's input is human speech. To input data for control equipment, the system will recognize spoken words. The project makes use of a DC geared motor for the movement of the lift. The embedded C programming language is used to program the microcontroller. The microcontroller is capable of communicating with all the input and output modules of an elevator. The Bluetooth module is used for the wireless connection between the user and the controller.

2.1 Voice Recognition System

Alternatively referred to as speech recognition, voice recognition is a computer software programme or hardware device with the ability to decode the human voice. Voice recognition is a technique for controlling a device, issuing orders, or writing without the need of a keyboard, mouse, or buttons .Today, this is done using ASR (automated speech recognition) software applications on a computer. Many ASR programmes require the user to "train" the ASR programme to recognize their voice so that it can more accurately convert the speech to text. For example, you could say "open Internet" and the computer would open the Internet browser.

The first ASR device, which was not computer-driven, was used in 1952 and identified single digits uttered by a user. Today, ASR programmes are utilised in a wide range of industries, including healthcare, the military (for example, F-16 fighter jets), telecommunications, and personal computing (for example, hands-free computing).

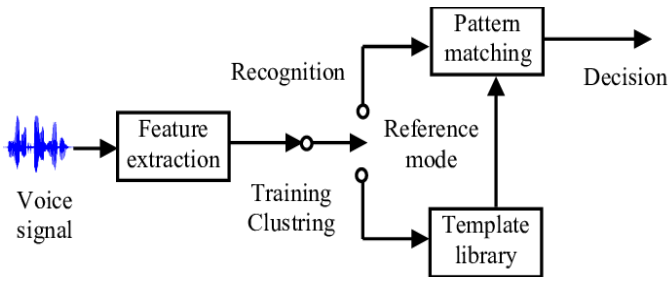

Figure 1: Voice Recognition System

2.2 System Flowchart

In the proposed system, a voice-controlled elevator system is introduced where the input commands to simulate the movement of the elevator system are kept convenient for the users. The commands include voice input for the floor operations, turning on and off of lights and fans present in the lift. The Raspberry Pi 3B+ is used as the main controlling unit and a USB microphone is used to get the user's input.

Initially, the microphone receives input data. Later, the Raspberry Pi recognizes the command and decides the operation. The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input and output) pins, allowing you to control Explore the Internet of Things by using electronic components for physical computing (IoT). We have used relays that can operate on small electric currents that can turn on or off a much larger electric current. A relay is an electromagnetic switch. It consists of a set of input terminals for a single or multiple control signals and a set of operating contact terminals. And later, it was connected to the elevator system. This system can accept floor number inputs as well as commands to turn on/off lights and fans. It doesn't need a computer or laptop to perform operations. It is a dynamic system. In addition to these features, it gives voice outputs like "Welcome to Touchless Elevator", "Ground floor", "First floor", "Lights On", "Lights Off" and so on through the speaker fitted in the elevator. In this way, this system is interactive.

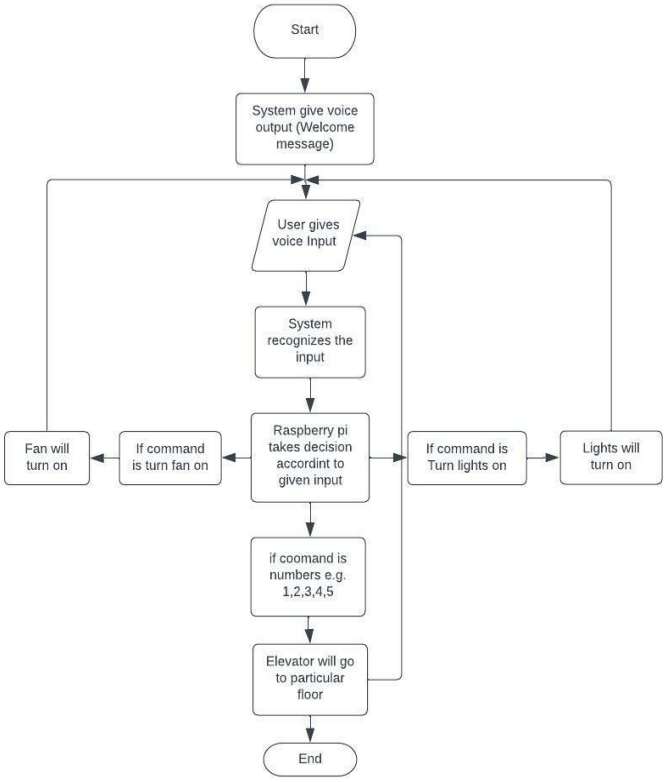

Figure 2: Flowchart of the System

2.3 Components Of The System

- Controller: Raspberry Pi 3B+
- Sensors: Microphone and speaker
- Power supply: 12v
- Tools: PyCharm, PuTTY, WinSCP
- HTTP/MQTT
- Eight relay (5v)
- Programming language:Python

2.4 System Diagram

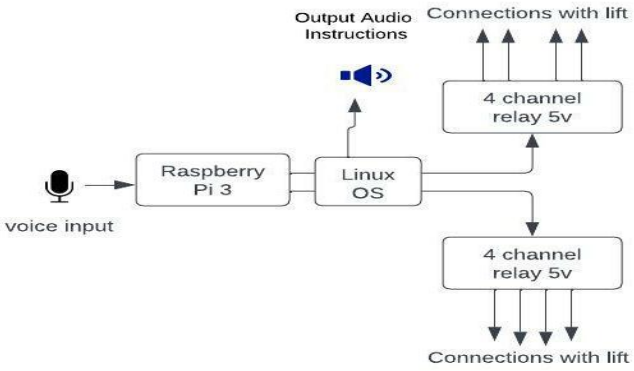

Fig -1: System Diagram

3. WORKING EXPLANATION

- First of all, a 5v power supply is given to the system using a mobile charger. The supply AC voltage is first converted to DC, and then to a high-frequency AC signal.This process helps to reduce the size of the charger.
- The Raspberry Pi 3 is turned on and ready to get input. An input command is received by the microphone in voice format. The Raspbeery pi recognizes the command and the linux operating system on the raspberry pi performs operations according to it.
- The python programme is stored in the OS of the Raspberry Pi. The Python programme has all the libraries needed for performing operations and understanding voice commands.
- Whenever a user gives commands, the programme directs the system to perform certain tasks.
- Eight 5v relays are used. One relay can perform a single task, like six relays for six floors, one for turning ON/OFF lights, and one for turning ON/OFF the fan. The connections from relays are connected to the elevator system.
- A 5v relay is an automatic switch that is typically used to regulate a high-current utilising a low-current signal in an automatic control circuit. The relay signal's input voltage varies from 0 to 5V.
- The system is additionally interactive thanks to the usage of a speaker. When a user enters the elevator, the speaker gives a welcome message and also when the smart elevator system identifies commands, it gives instructions on which command is going to be executed.

Table -1: Working Explanation

Commands	Actions performed	Voice Output (Speaker)
Ground /First/ Second/Third/Fourth/Fifth	Lift will go to respective floor	Ground /First/ Second/ Third/Fourth/ Fifth floor
Turn lights ON/OFF	Lights will be turned on/off	Lights ON/OFF
Turn fan ON/OFF	Fan will be turned on/off	Fan ON/OFF

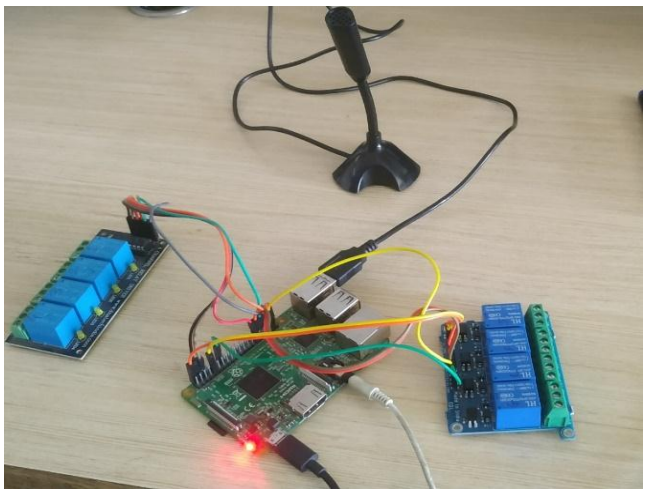

Figure 4: Working model of a Smart Elevator

3. CONCLUSIONS

The voice-controlled elevator is very useful. This project tries to shed light on the voice recognition system, which can be used to modify the conventional elevator and make it more efficient and usable for physically challenged people. This implementation brings together all the features that can be needed to make sure that the services provided by it make the system independent. It will make it easier for users to use the elevator service and will be of great benefit to physically-impaired people, reducing their reliance on others to use the elevator. It resolves the issue of pressing the switches all the time for moving up or down, which becomes quite difficult in crowded hours.

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