Voice enabled Elevator system

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ABSTRACT

After the emergence of COVID-19 and its extremely rapid spread, especially through coming in contact with respiratory fluids, many students' engineers, and scientists have worked to create papers or work on ideas that contribute to reducing the spread of the virus. With the development of technology and reliance on voice control interfaces and gestures in many papers, the idea of adopting voice in elevators instead of touch has been born. The problem that the paper will solve is moving away from physical contact with the elevator or touching the keypad, choosing the floor to reduce the spread of viruses by touching the elevator. The problem is solved by using a voice recognition module in the elevators instead of the keypad. The paper aims to reduce the spread of the Coronavirus by using voice to choose the floor number instead of touching the keypad to choose the floors in traditional push-button elevators. The paper is characterized by the presence of two characteristics, which are the voice and gestures, the voice through the voice recognition module that was controlled by the Arduino to receiving the voice of the user to select the required floor number, and the gestures through the IR Senser the user indicates to request the elevator to ascend or descend. The tiring method for this paper is the waterfall method for its perfect fit and ease of execution on this paper. The program used for this paper is Arduino. The paper contributed to the development of elevators and the use of advanced technologies, as well as limiting the transmission or spread of viruses through touch, and it also has advantages that everyone can use, whether they suffer from a disability such as blindness or not.

Keywords - COVID-19, Arduino, Voice Enabled

INTRODUCTION

The spread of the Coronavirus rapidly through touch has led to measures being taken not to come into contact between individuals and to approach things. Places that must be touched or pressed by hand People used gloves or wooden sticks to press, such as elevators, but the use of the latter is not the suitable solutions for use, especially for a long period, so voice control and gestures are among the solutions that help reduce the spread of the virus. The main idea of the paper is to use voice control in elevators to reduce the spread of the virus, and the elevators were chosen because they are used in all places, whether public or private.

BACKGROUND OF THE PAPER

Elevators are important in daily life, as many people depend on them, especially in workplaces, hospitals, airports, and hotels, but they are also considered one of the places that cause the most spread of viruses, especially the types that spread by touch. To obtain a safe and secure transportation environment, especially in this period during the spread of Covid-19, the idea of this paper, which will work to solve this problem, in which touch is the main cause of transmission of the virus has emerged. In this paper, the researcher discusses the elevator that is controlled by voice to limit the spread of the virus by the voice recognition unit, so it works on transfer the traditional elevator that works by pressing the keypad, to a smart elevator controlled by the human voice. The researcher selected this topic for the sake of humanity's safety from the spread of the virus to touch in elevators by avoiding physical

contact with the elevator. The paper works by linking all inputs and outputs to the Arduino, one of the most important inputs is the voice recognition model that responds to the human voice and sends it to the Arduino to convert it to the C programming language and comprehend the floor number that the person mentioned and then move the elevator to the chosen floor. The IR sensor is also considered one of the most important inputs because when a person requests the elevator while they are outside, he uses his hand to gesture to call the elevator up or down, the most important outputs are the LCD screen in which information about the floor number of the elevator is displayed.

PAPER AIM
The paper aims to prevent physical contact with the elevator to limit the spread of viruses (COVID-19) that are transmitted through touch.

Paper Objectives
i.   Designing a circuit that controls the elevator through the voice recognition module and sending the user's command to the Arduino.
ii.   To sense the user's hand gestures, infrared sensors are used to call the elevator up or down.
iii. Displaying commands for the elevator through voice and gestures on the LCD screen in a visual way.

Methods

The method chosen for this paper is the V-Model because of its ease of management, infiltration of events or steps in it in the form of a strictly V-shape and a solid model so that a stage does not start until after the completion of the previous stage, each step-exit is identified and reviewed to avoid errors and defects smoothly and easily early, the integrity of data and steps for a paper, and the compatibility of the method for many complex papers, whether or not. (GeeksforGeeks 2021)
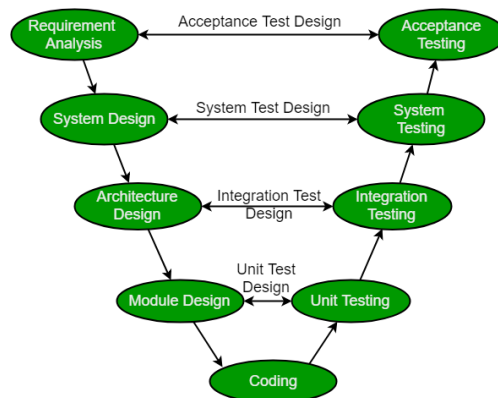

Figure 1: V-Model   (GeeksforGeeks 2021)

The V-Moodle method is a method that includes the two main phases which are the design phase and the testing phase, each phase includes some steps, and each step begins after the completion of the previous step. The method is also called the verification and validation model. The method is symbolized by the letter V. (GeeksforGeeks 2021)

Advantages of the V-Model

Simplicity, ease of understanding and use, as well as tracking paper progress accurately, and finally, discipline, when a phase is completed, the next phase begins. (GeeksforGeeks 2021)

Disadvantages of the V-Model

Its lack of suitability for complex and object-oriented papers and one of the disadvantages is also its lack of support for the idea of repeating stages. (GeeksforGeeks 2021)

The phases of the V-Model

1- **Design Phase:**
   - Requirement Analysis: In this phase, data, information, and requirements needed for the paper are collected, and expect the final result of the paper. For this paper, requirements and components are recorded, setting the start and end date for each phase, and planning the master plan for the paper. (GeeksforGeeks 2021)
   - System Design: In this phase, the outputs of the requirements analysis phase are studied, which are required specifications, and then the system requirements (technical design) are determined, such as services, language programming. In this paper the programming language used, block diagram design, and other technical information will be prepared. (GeeksforGeeks 2021)
   - Architectural Design: At this phase, the system is designed, but more specifically, such as data transfer and the method of communication between parts. For this paper, the correct connection between components and the program used will be known. (GeeksforGeeks 2021)
   - Module Design: In this phase, the internal units of the paper are designed in detail and are compatible with other units in the system. (GeeksforGeeks 2021)

2- **Testing Phases:**
   - Unit Testing: At this phase, a test is performed for the paper by examining the codes and making sure that they are suitable for the paper to start using, for the paper, the codes are combined with the components to ensure that the paper flow is working perfectly. (GeeksforGeeks 2021)
   - Integration Testing: In this phase, a test for the paper, which is called the integration test, which is related to the architectural design stage, is performed by testing the internal units of the paper. For this paper, the method of connecting the components to each other is examined and their compatibility with the codes. (GeeksforGeeks 2021)
   - System Testing: At this stage, the paper is tested for the system in general, the communication methods, and the requirements, whether functional or nonfunctional. (GeeksforGeeks 2021)
   - User Acceptance Testing: At this phase, a test of the paper is conducted in a live environment to discover if there is any defect in the paper in terms of performance and compared to similar systems. (GeeksforGeeks 2021)

LITERATURE REVIEW/THEORY

This literature review contains the articles bearing the same topic as this report, in which the researcher has made an excellent effort to produce the paper.

Table1: Summary of papers reviewed on" **Voice enabled Elevator system**"

| Title, Author, Year	Concepts, approach, methods, and analysis,	Inconsistencies, gaps, contradictions, differences	Improvements
Elevator for Blind People Using Voice Recognition, Bansode,2015	elevator for blinds consist of two parts, a control device with the blind, and a control unit located in the elevator	There are two units, the elevator unit, and the remote-control unit	Text-to-speech
Using Speech Recognition Create Smart Elevator Controlling, CVA, K,2017	Programming the microcontroller through the MATLAB program and the presence of the voice recognition system to produce a mechanism for communication between the user and the microcontroller.	Using the MATLAB program	--
Elevator Control Using Speech Recognition for People with Physical Disabilities, Berardini, A,2019	Using the Arduino program to program the Arduino Uno and using the speech recognition with the voice sensor.	Arduino Uno, 7 segment display.	--
A Voice Recognizing Elevator System, KRS, B,2016	The use of Sphinx4 and programming by the Java language to control the elevator.	Using more than one language, Sphinx4	Using more than one language
Elevator Voice Operated Intelligent Lift, CVA, K,2017	IR sensor is used to detect the user, MATLAB program to program the microcontroller (PIC 16F883) to read the required number.	The microcontroller used is PIC 16F883, the program used is MATLAB.	--

DESIGN AND ANALYSIS

System Block diagram
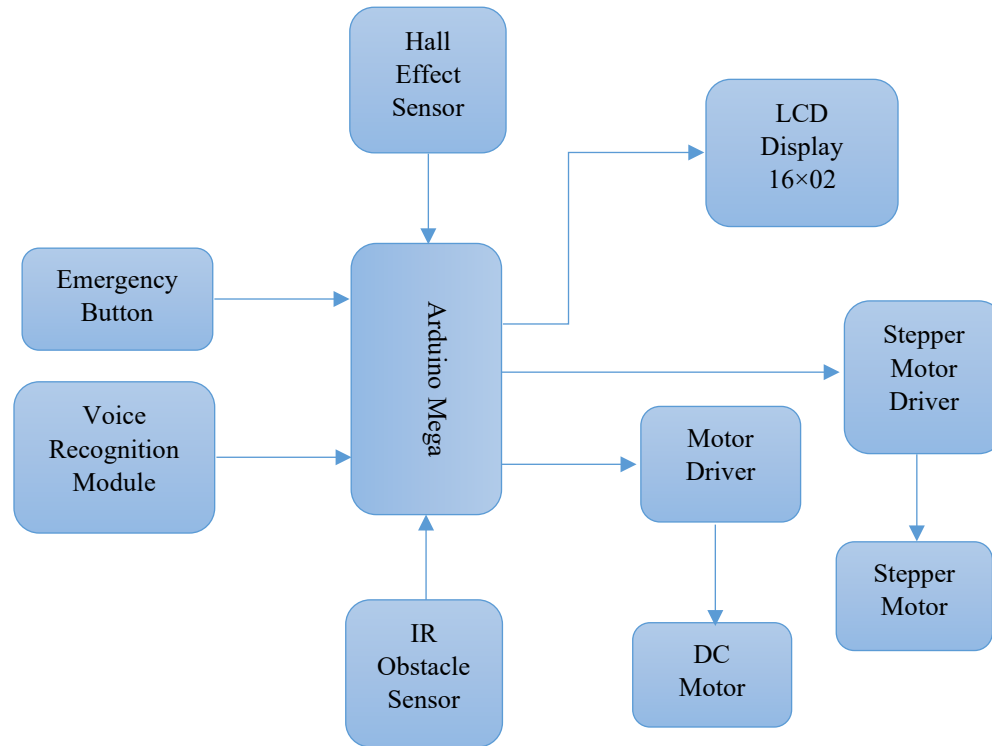
Figure 2: System Blok Diagram

Figure 2 shows a system block diagram. The system contains system inputs and outputs, system inputs: IR obstacle sensor, voice recognition module, hall effect sensor, and emergency button, system outputs: DC motor, motor driver, LCD Display, stepper motors, and stepper motor driver. The IR obstacle sensor connected to the Arduino works on sensing the user's gestures to open the elevator door, the voice recognition module receives the user's voice and sends it to the Arduino, the motors work to move the elevator and open the door, the position of the elevator parking is known through the Hall effect sensor, and the last LCD screen in which it is performed Emergence of the data.
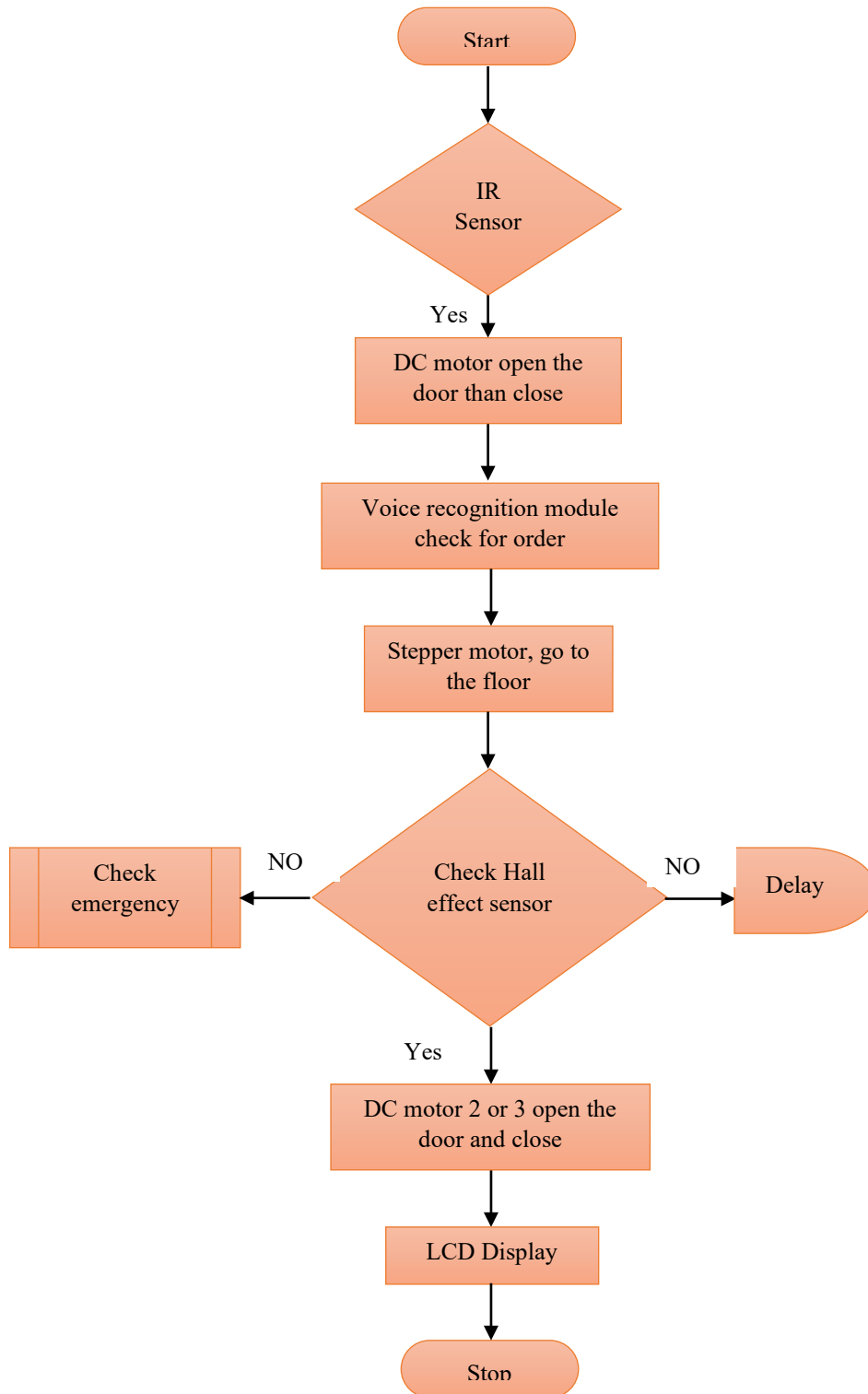
System Flow chart

```
                    Start
                      │
                      ▼
                  ╱ IR ╲
                 ╱Sensor╲
                  ╲    ╱
            Yes │
                      ▼
            DC motor open the
            door than close
                      │
                      ▼
            Voice recognition module
            check for order
                      │
                      ▼
            Stepper motor, go to
            the floor
                      │
                      ▼
   Check          ╱ Check Hall ╲          NO
   emergency ◄── NO ╲ effect sensor ╱ ──►   Delay
                      ╲          ╱
                  Yes │
                      ▼
            DC motor 2 or 3 open the
            door and close
                      │
                      ▼
                LCD Display
                      │
                      ▼
                    Stop
```

Figure 3: System Flow Chart

Figure 3 shows the flowchart of the system. When the user arrives at the elevator and starts calling the elevator for the floor where he is located; For example, the first floor, the elevator leads to the first floor at the user, the DC motor opens and closes the door after the user enters, the user speaks and chooses the floor number he wants with the speech recognition module, then the elevator starts heading to the desired floor with the help of the stepper motor, examines the hall effect sensor If the floor 2 or 3 is reached, the floor that was chosen, and when an emergency occurs, the emergency button can be pressed and an alarm sound sounds. When reaching the desired floor, the DC motor opens the door and closes it when the user exits, the LCD screen numbers appear Floors, then the elevator stops, and steps are repeated when the elevator is called again.

System Design
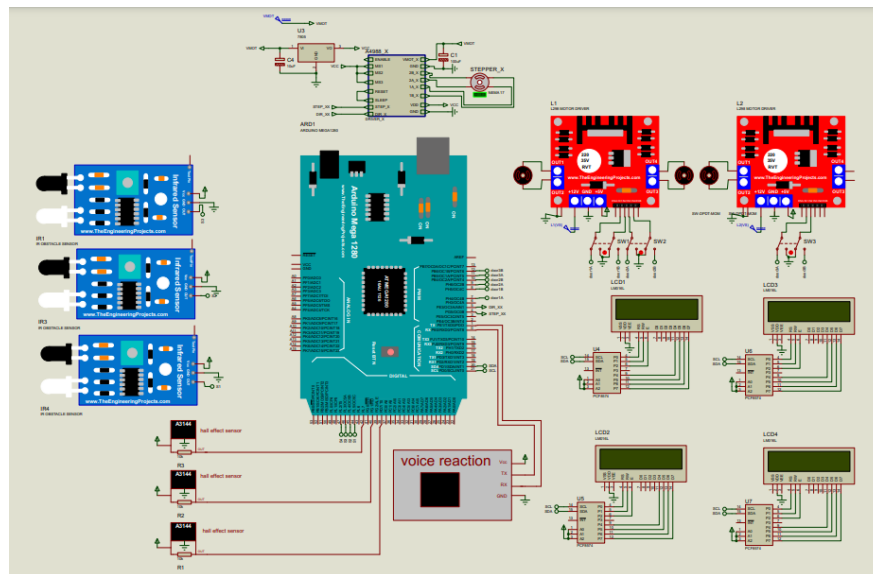
Figure 4: System design

The following figure shows a circuit connection for a Voice enabled Elevator system paper. In the beginning, the Arduino Mega, which is the controller, is placed in the circuit that will be programmed, which contains the inputs and outputs of the variable, fixed or digital signal, and the serial communication ports, The Voice Recognition Module is connected through the serial communication ports on the Arduino to record the instructions that will be used in the system, and the IR Obstacle Sensor is connected to the Arduino that will sense the user's gestures, as well as connect the hall effect sensor whose function is to know the location of the elevator in any floor, The use of 3 sensors for 3 floors was connected with a resistance of 10K to the output of the digital signal without fluctuation, the stepper motor is connected to the stepper motor driver that works to control it and then connected to the Arduino, and also a regulator is connected to the circuit to work on the shortage of the power supply 12 volts to 5 volts because some The component is powered by 5 volts, the DC motor is connected to

the motor driver so that it can be controlled and connected to a limit switch to ensure the stability of the DC motor and not to move, and then connect them to the Arduino, the LCD screen has been connected to the IC so that the 17 pins are not connected An Arduino port, but only two ports are connected, and the wires in the circuit were reduced with codes between the two connected ports, and finally, all the components were connected to the ground and the power source.

Conclusion

The main goal of the paper is to reduce the spread of COVID-19 by touch, especially in elevators. The Arduino Mega was used with a voice recognition unit with infrared sensors to produce an elevator system that is controlled through voice and gestures were entered into the system. An introduction to the paper was discussed through the background paper, and the most important objectives related to the paper, and the places where the system could be located. A discussion was made about the methodology, which is the V-model that walks with good and smooth steps, and articles similar to the idea of the paper were summarized and a comparison was made between them and the new system. contains valuable information related to the system, its design analysis. The paper will provide a new improved secure elevator system, due to the presence of voice control and security, due to the lack of it causing the spread of viruses.

Acknowledgements

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