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Voice Assistant for Home Automation

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ABSTRACT

Smart Homes have been a go-to sector in modern eras, with the ever wants for comfort driving the human race to seek out even more technical breakthroughs as a solution to their difficulties. Home automation and voice-controlled apps have become more accessible thanks to advancements in virtual assistants such as Google Assistant and Alexa are more common, and the development in information technology (IT) and artificial intelligence (AI) has led to advancements in several types of home automation, allowing appliances to be managed quickly and conveniently. The benefits of voice-based technologies will be recognized rising among other technologies in terms of feasibility, according to a survey of numerous home automation systems. The proposed idea is programmed to transfer voice commands to the smart microcontroller using Graphical User Interface via a user wireless microphone (connected to the user cloth). With simply a voice control, we can manage our home appliances. We can turn on and off electronic equipment, and it also recognises an individual's face mask.

KEYWORDS: Artificial Intelligence, Face Mask Detection, Covid-19, Home Automation, Voice Command

INTRODUCTION

Standardization of everything is need of the moment throughout this modern age of technology. The primary goal of fundamental development is to make human life easier. The goal of home automation is to automate people's life. Home Automation is the process of controlling home appliances without using switches and instead by using a smartphone. House automation is use of one or more electronic remote controls to virtually sometimes and automatically operate basic home operations and features [1-5]. Wireless technology is being emphasised more in today's environment. That's because network devices are inefficient and difficult to manage. Wireless technology like these have had a favourable impact on people's lives, and the rate of human growth has accelerated. Standards have progressed tremendously in recent years, and the

marketplace now offers a variety of devices that use these specifications for smart home [6]. The use of voice commands to interact with a few alternatives is becoming increasingly prevalent. The Google Home, Apple Home Pod, and Amazon Echo are among the gadgets available, and the latter is the much more innovative and popular [7]. In 2016, Amazon released the Amazon Echo, which is linked to Alexa, Amazon's intelligent virtual secretary. Alexa is a cloud-based platform that turns users' voices into text and analyzes it to react audibly, musically, or send commands to other smart devices like a Wi-Fi capable fluorescent lamp [8].

Switches are controlled by voice throughout this design [9-10]. One of the key reasons for choosing voice in these proposed systems is that it is easily duplicated by humans. Furthermore, using voice provides a control mechanism that is both effective and comfortable to use. This platform's use entails changing the switching mechanism from the old method of physical touch with the switches to a safer one that uses voice to substitute all human intimacy [11]. This project comprises a simple audio amplifier that employs a transistor and a relays to link all of the gadgets to the power source, The suggested project would recognise the participant's demand and successfully execute the desired output. The ability of a home automation system to conduct tasks such as triggering or controlling appliances or gadgets in the home [12-15] defines it.

COVID-19 is a virus that is transmitted from one person to another and can be prevented by wearing a face mask properly. COVID-19 could be kept under control if people keep a strong social distance and use a face mask [16]. Unfortunately, people really aren't following the guidelines, which is hastening the spread of the infection. Face mask detection is a technique for determining whether or not someone is wearing a mask. The phrase 'You Only Look Once' is abbreviated as YOLO [17]. This is a real-time algorithm that finds and recognises numerous items in a photograph. Detecting any thing from a scene is comparable. COVID-19 growth can be slowed by sensing the face toner on an individual 's face [18-20].

BACKGROUND STUDY (LITERATURE)

A detailed explanation of the papers to explore the existing research, the approaches and the drawbacks identified is given in the following section.

The study "A Novel Detection Framework About Conditions of Wearing Face Mask for Helping Control the Spread of COVID-19" aims to detect perfectly alright mask using states like face without mask, face wearing incorrect mask, and face with proper mask. For such a

goal, a useful linked dataset is required, but it only recognises faces or raw photos in the database, which appears to be the current work's restriction [20-23].

The study paper "An Automated System to Limit COVID-19 Using Facial Mask Detection in Smart City Network" aids in the recognition of masks on people's faces in public places, however the system's shortcoming is that differentiating each human personality in a highly crowded location is difficult. Recognizing someone without a face mask in this situation would've been extremely difficult for the proposed system. To acquire the best results from this system, the city needs a huge number of CCTV cameras to watch the entire city, as well as devoted manpower to enforcing the rules against violators. The system has failed whenever there is a network outage because the data about the offender is provided by SMS [24-29].

METHODOLOGY

1. Home Automation System

It is very useful for blind and physically disabled people to switching ON and OFF the electronic lights and fans at home only by giving voice command. For this we have used Arduino Uno Board and Relay Board connected through the laptop and jumping male female wires. Following are the steps for its connection for controlling our electronic appliances [30-31].

- There are both Digital as well as Analog pins available in our Arduino Board. Among which we are only using digital pins.
- After installing the Arduino IDE in our system our aim is to blink the built in LED lights in Arduino Board.
- For blinking process, we used C++ program in IDE software.
- After uploading the C++ code in IDE, the LED lights starts to blink.
- Then used 4 channel relay board to connect the bulb holder's wire.
- In relay board each channel has 3 inputs (+ve, -ve, and neutral).
- The connection is given between one end of the bulb holder wire with the +ve of first channel in relay module and the other end with the neutral of first channel in relay module.
- 4 jump wires are used to connect the relay channel with the Arduino.
- One end of the first jump wire is connected with the Ground pin of relay channel and other end is connected with the Ground pin of Arduino Board.

- Similarly, one end of the second jumpwire is connected with the VCC pin of relay channel and other end is connected with the 5V pin of Arduino Board.
- The last jump wire is connected with the IN1 pin of relay channel and other end is connected with the pin number 7 of Arduino Board [32-38].

2. Face Mask Detector:

For Face mask Detector the steps we including are:

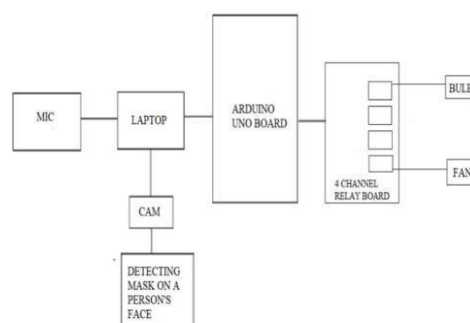
- At first it loads face mask dataset.
- It trains face mask classifier with Keras/Tensor Flow.
- Then it serializes face mask classifier to disk.
- After serializing it loads face mask classifier from the disk.
- Once the classifier is loaded from the disk it starts detecting faces in image/video stream.
- Then process for each face ROI begins.
- It starts applying face mask classifier to each face ROI to determine mask as “mask or no mask”.

At last, it shows the results and warning sound which will be coming out from the system continuously until the person wear the mask.

IMPLEMENTATION

1. Home Automation System

- Voice input given through a mic connected with the laptop.
- Arduino uno board gets activated using ArduinoIDE software installed in the laptop.
- Check for led blinking in Arduino board.
- Fan and Bulb is connected with the relay board which will be performing ON and OFF



operation through voice command.

Figure 1: Architecture of Home Automation using voice command.

2. Face Mask Detector:

Our goal is to develop a bespoke deep learning method that can detect whether or not someone is wearing a costume. We must divide our project into two parts, each with its own set of sub-steps, in required to practice a bespoke face mask detection system:

- **Training:** We'll concentrate on importing our face mask detecting dataset from disc, developing a model on it (using Keras/ TensorFlow), and serialising the face mask detector to disc in this section.
- **Deployment:** We may then upload the mask detection, perform facial recognition, and categorise each face as having a mask or not having a mask once the face mask detector has been developed.

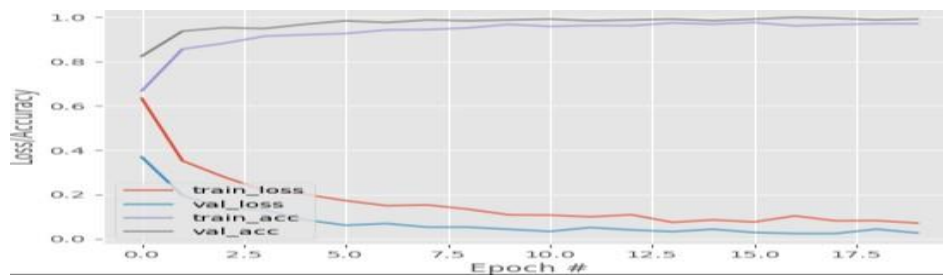


Figure 2: COVID-19 face mask detector training accuracy

- The above Figure 2 shows the COVID-19 face mask detector training accuracy/loss curves demonstrate high accuracy and little signs of over fitting on the data.
- As we can see, we are obtaining **~99% accuracy** on our test set.
- Looking at **Figure 2**, we can see there are little signs of over fitting, with the validation loss lower than the training loss.

CONCLUSION

People's lives will be made easier and more comfortable by using a home automation. This program includes speech to turn on and off lights, fans, and televisions, allowing the elderly and disabled to perform basic household tasks on their own. With less time, it effectively recognizes the trained voice command supplied to it. It assists in spotting faces that are not wearing masks and issues a warning. The Arduino Uno is a cost-effective and efficient foundation for building a smart home.

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