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AUTOMATIC GATE BASED ON FACEMASK & TEMPERATURE DETECTION

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Abstract - Since it began spreading over the globe some months ago, the coronavirus COVID-19 pandemic is causing major health issues. Consequently, the World Health Organization, all of them are donning masks situations where individuals gather together are advantageous and secure tactic (WHO). temperature of the body Along with the face mask, sanitization is crucial. factors that affect safety. Therefore, it's more crucial to keep track of who is and is not wearing a mask. Consequently, our organisation has chosen to address this issue, and We think that our approach will be successful in lowering the spread of this infectious disease by encouraging using face masks, routinely sanitising, and maintaining a secure workplace.

Key Words: OpenCV, TensorFlow, Virtual Serial Port Emulator, Serial Communication, Raspberry Pi, Data set

1.INTRODUCTION

Since its primary origin in Wuhan, China, the corona disease, or COVID-19, has spread quickly to a number of nations, including India, the second-most populous country in the world. a nation with a population of more than 134 billion people. people. India has a sizable population, therefore it would have a problem controlling the coronavirus's spread.

Face Using sanitizers and masks is the most efficient way to lessen transmission. In terms of lowering sickness transmission, which has produced positive outcomes. Flu, sore nasal congestion, sore throat, fatigue, loss of taste and smell Congestion is one of the many signs of coronavirus. infection.

It is transmitted most of the time. indirectly by way of surfaces Incubation times can range from exceedingly long, in some cases lasting up to 14 days, the virus can immediately assault through the respiratory droplets.

Since its primary origin in Wuhan, China, the corona disease, or COVID-19, has spread quickly to a number of nations, including India, the second-most populous country in the world. a nation with a population of more than 134 billion people. India has a sizable population, therefore it would have a problem controlling the coronavirus's spread. Face Using sanitizers and masks is the most efficient way to lessen transmission.

When it comes to lowering inequality, Governments implemented measures to decrease illness transmission. a range of precautions and safety measures, including social seclusion, the requirement to wear masks inside, quarantine, Limiting residents' ability to leave the country and travel within it, isolating them, and cancelling or excluding them from significant social events meetings and events. Pandemic COVID-19 has influenced both professional and social activities conversations, as well as various kinds of sports as well as on- and off-screen enjoyment.

People with high body temperatures shouldn't be permitted in public spaces since they run the danger of getting sick and wearing a mask to prevent the spread of the infection. At the entrances to any city, workplaces, and retail establishments temperature checks, clinic entrances, and veil checks are also essential. Finally, a cunning passage device that afterwards measures the level of interior body heat and finds the cover at the entrance it was designed to open framework..

2. LITERATURE REVIEW

Real-Time Implementation of AI-Based Face Mask Detection and Social Distancing Measuring System for COVID-19 Prevention.

Safa Teboulbi, Seifeddine Messaoud, Mohamed Ali Hajjaji, and Abdellatif Mtibaa developed a system for detecting face masks in real-time and measuring social distance in order to prevent COVID-19.October 27, 2021. In this project, the creation of a Face Mask and Social Distancing Detection model utilising an embedded vision system is the main goal. This system monitors people in real-time, whether they are wearing masks or not, and ensures social distance by triggering an alarm whenever a violation takes place in the scene or in public places. To enable these analytics, which may be used in a range of industries in addition to workplaces and airport terminals/gates, this may be combined with the current embedded camera infrastructure.

2.1 Real Time Face Mask Detection and Thermal Screening with Audio Response for COVID-19

For COVID-19 - M. SivasankaraRa, K. Tejasree, P. Sathwik, P. Sandeep Kumar, and M. Sailohith - Real Time Face Mask Recognition and Thermal Screening with Audio Feedback. 4th July 2021. We collected pictures of people wearing

masks and not wearing masks from several sources and trained a deep learning system on them. Among the methods mentioned would be used to find face masks. The temperatures is then automatically checked and disinfected after that. Finally, the suggested system outputs audio and voice information as well as the user's body temperature whether or not the face mask is used.

2.1.1 Auto Temperature and Mask Scanning Entry System

Rubana Khan, Kshitijrangari, payalkapse, and Chetan Asutkar are member of the Auto Temperature and Mask Screening Entry System. June 2021. Without contact, temperature sensing and mask detection. The contactless temperature sensing subsystem utilises an Arduino Board with an infrared sensor or a thermo camera, while computer vision techniques are used on a camera-equipped PC to conduct mask detection and social distance checks.

2.1.2 Artificial Intelligence Based Mask Detection With Thermal Scanning and Hand Sanitization Based Entry System

Ashlesha D. Mahalle, Mr. Rahul Nawkhare, and Mr. Ashish Bandre's Artificial Intelligence Based Mask Detection With Thermal Scanning and Hand Autoclaving Inspired Registration System. June 4, 2021 a reliable and economical method of using artificial intelligence to improve working conditions in an industrial environment. A hybrid model combining deep and conventional machine learning will be created for mask recognition. Images with and without masks are included in a face mask identification database.

2.2 IoT and Deep Learning Based Approach for Rapid Screening and Face Mask Detection for Infection Spread Control of COVID-19

Muhammad Ayoub, Yang Yu, and Shabir Hussain. Weiyan Hou, Akmal Khan, Rukhshanda Rehman, and Junaid Abdul Wahid. April 13, 2021 They recommended an IoT-based Smart Screening and Disinfection Walkthrough Gate for all public area entrances (SSDWG). In the suggested IoT-based screening system, real-time deep learning models for face mask detection and classifications were also included. The SSDWG is designed for rapid screening and includes contact-free temperature measurement in addition to the retention of the suspected person's record for management and monitoring in the future.

2.3 Coronavirus: Face Mask Detector with OpenCV, Keras/TensorFlow, and Deep Learning

Fourth May 2020, by Adrian Rosebrock. In this exploratory article, a Face Mask and Social Distancing Detection model is implemented as an embedded vision framework. In our particular circumstance, pretrained models like MobileNet, ResNet Classifier, and VGG are used. Similar research into multiple face location and facial covering order models is also provided in this paper.

2.4 Real Time Temperature Graph utilizing MATLAB and Arduino

Avijit Roy and Ritwik Biswas May 2020. Temperature detection and cover location without physical contact. The Arduino Uno is used to power the contactless temperature sensing subsystem, which uses an infrared sensor or warm camera. Meanwhile, the cover placement and social removal check are carried out using PC.

2.5 IoT-Enabled savvy entryways for observing internal heat level and facial covering location

2019 November A new member of the open overlay board has joined: B Varshini, HR Yogesh, Syed Danish Pasha, Maaz Suhail, and V Madhumitha.

Nov. 20, 2021 This study describes an IoT-enabled smart doorway that makes use of an AI model to monitor the temperature inside and the location of facial coverings. A non-contact temperature sensor is used to check the person's interior heat level as well. The Face Mask Detection computation, which makes use of the TensorFlow programming framework, completes evaluation of the suggested structure.

2.6 Coronavirus Face Mask Detection

Megha Patidar, Samarth Vijayvargiya, Sejal Nayak, and Parul Maurya. Walk 2021. To determine whether you are wearing a facial covering to protect yourself, a Convolutional Neural Network (CNN) model using TensorFlow, the Keras library, and OpenCV is very basic and easy to understand.

3. METHODOLOGY

Our project's operation is completely simulated. As the primary microcontroller for integrating the sensors and generating the outputs, Raspberry Pi is being used.

Two sections constitute the methodology:

Python code is used to simulate a mask detection system that can recognise a person's face mask in real time. If a person is wearing a mask, the output will be mask detected in green, and if they are not, it will be no mask in red.

The result of the Python function is then used in Proteus utilising COMPin to perform temperature detection.

4. CIRCUIT DIAGRAM

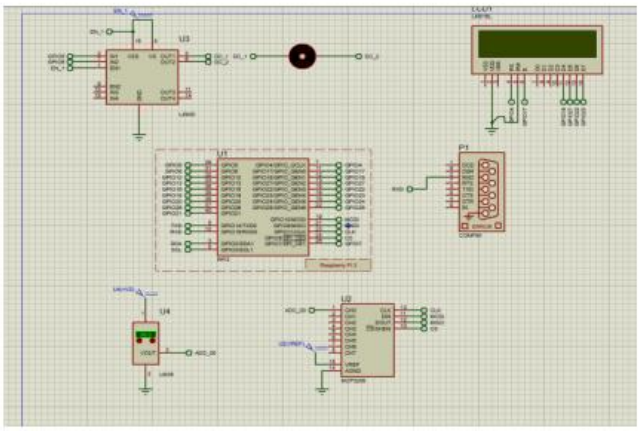

FIGURE-1 Proteus Simulation

Sensor reading using Proteus:

Utilizing the Raspberry Pi and the LM35 sensor. In proteus, the surroundings are replicated. To begin with, the sensors send the microcontroller the readings they get from the subject. The Raspberry Pi's rx/tx serial port is what we're using to display the sensor readings on the LCD. The temperature of a visiting guest will be shown on one serial port.In order to alert the person screening the visitors when the temperature exceeds the threshold, we also added a buzzer. When the temperature exceeds the threshold, the motor won't turn on, signalling that the gateway is closed.The gate will open if the user is wearing a face mask and has a body temperature below 100° C; otherwise, the gate will remain closed.

We are utilising a Virtual Serial Ports Emulator (VSPE) to build a virtual port in the system via which the microcontroller will be connecting with two the serial communication windows since there is no option to simulate NODE MCU in Proteus Simulation Suite. Configure and start the COM1 and COM2 serial ports in the VSPE programme. After setting up the Raspberry Pi, launch the proteus simulation to obtain the results.

Visualising and analysing for face mask using MobileNet:

We had a data set for mask detection that included about 1900 photos of persons wearing and not wearing masks. We trained our face mask detection model using this batch of data. We then looped over this folder to turn all of these photos into arrays in order to build a deep learning model.

After turning the array of processed photos into a mobile network, we max pooled the data before flattening it to produce a completely connected layer to obtain the outcome.In comparison to a convolutional neural network, mobile networks handle information relatively quickly.

We use COMPin in proteus to do serial communication utilising this output. This output, together with the temperature sensor value, is used by Proteus to determine whether or not to open the gate.

The question arises why we use MobileNet, why we can't use Resnet, VGG or alexnet or Mask RCNN :-

A masked face may now be identified with greater accuracy thanks to MobileNet CNN.Mobile net's core engineering consists of a 33 depthwise convolution followed by an 11 pointwise convolution, whereas Resnet or Alexnet has a large organisation size and expands the number of calculations.

Additionally, MobileNet has an advantage over CNN or CNN execution because it is multi-stage open.

5. RESULTS

FIGURE-2 Without Facemask

With a dataset of about 1900 photos, we implemented all deep learning techniques and algorithms in the Mobile Net software to get this outcome.

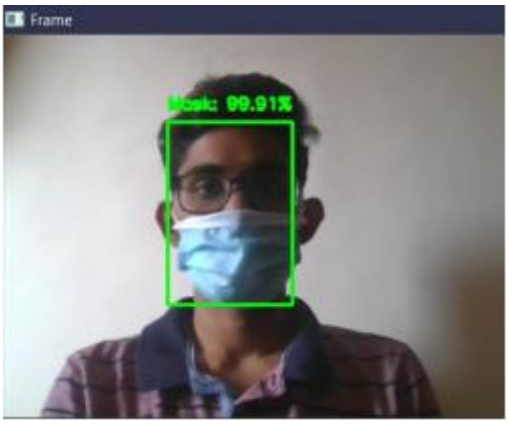

FIGURE-3 With Facemask

5.1 PROTEUS OUTPUT

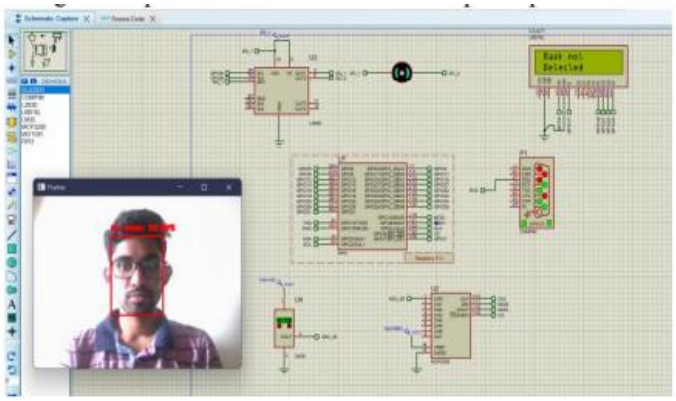

FIGURE-4 Proteus output

The gate does not open when the user is not wearing a mask; instead, an LCD message reading "Mask not detected" is displayed. We can see from the output that we successfully attained high training accuracy as well as high value accuracy. The likelihood that the model will identify the face mask is known as training accuracy. Value correctness is a measure of a model's effectiveness. In our model, we have 99% accuracy.

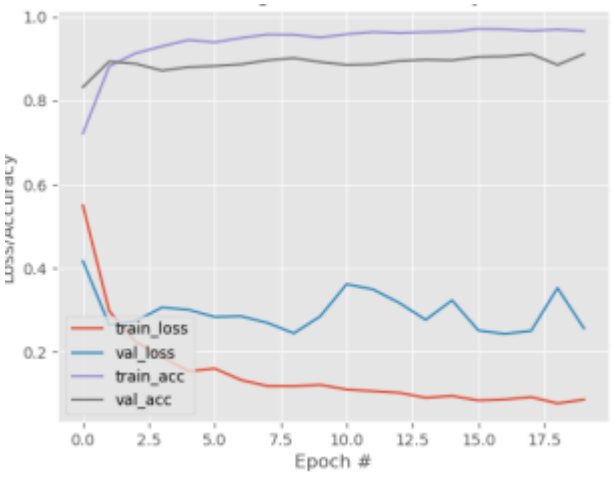

FIGURE-5 Training Accuracy and loss

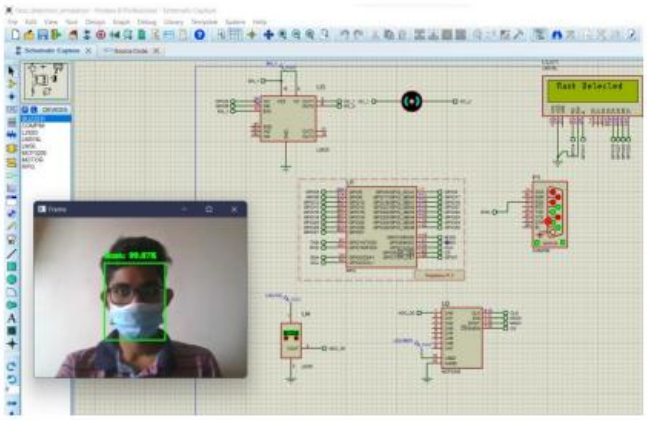

FIGURE-6 Giving with facemask as input to proteus circuit

The LCD shows the message "Mask Detected" when the user is donning a mask. If the user is wearing a mask, the temperature is determined using an LM 35 sensor after the mask detection check is complete. The gates will open if the temperature is below 100° C; if the temperature is above 100° C, the gates won't open and a High Temperature notification will appear on the LCD.

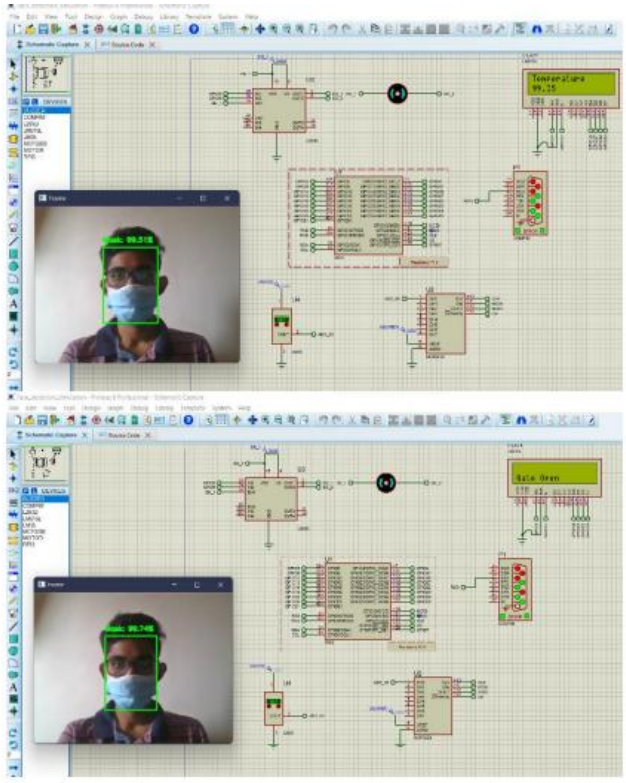

FIGURE-7 With temp <100° C

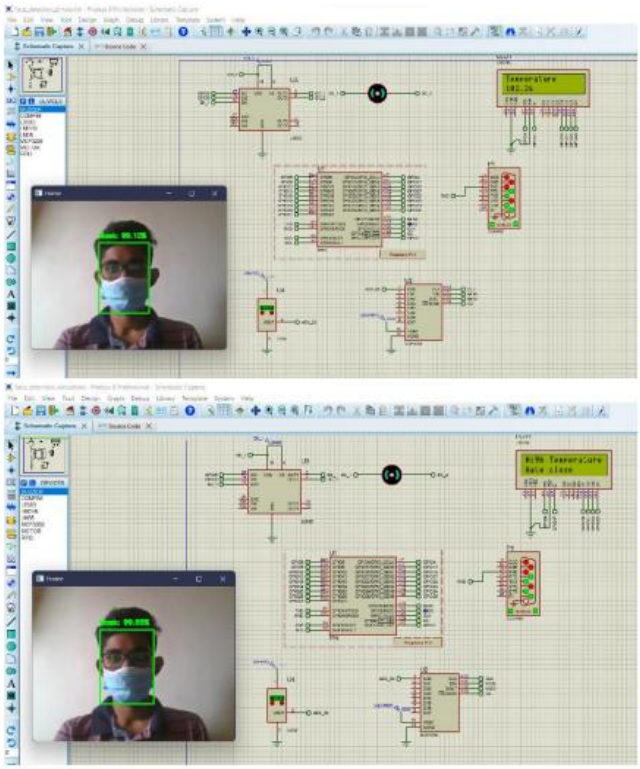

FIGURE-8 With temp >100° C

6. CONCLUSION

We have finished a project that can be used to monitor all visitors entering through mall gates 24 hours a day with inexpensive equipment. This will indirectly benefit shopping malls because they will need to hire fewer staff members to physically check visitors into malls and other similar locations. We used CNN, OpenCV, Tensor Flow, Keras, and Keras to determine whether or not people were donning face masks. Utilizing still photos and live video, the models were assessed. The model has been verified, and model optimization is a continual process in which we produce a precise response by changing the hyper parameters. An example of edge analytics using this concept is possible. With the help of this technology, we will be able to recognise those who are hiding their faces and let them in, which will be very helpful for society.

7. FUTURE WORKS

The lack of a unified approach and dataset to address both issues, low masked face recognition accuracy, and less uncovered face exposure, which makes it challenging to capture enough facial landmarks, among other issues, are drawbacks of the existing research on face mask detection and masked facial recognition. To address the shortcomings of earlier methods, we proposed an unique Deepmasknet model that is capable of accurate face mask detection and masked facial recognition. Our proprietary end-to-end Deepmasknet model automatically extracts the most discriminating features for accurate face mask identification and masked facial recognition. The suggested technique is unaffected by variations in facial angles, illumination, gender, skin tone, age, types of masks, occlusions (glasses), and other factors.

To evaluate the performance of face mask detection and masked facial recognition systems, we produce a large-scale, diversified MDMFR dataset. Rigorous experiments were conducted to demonstrate the effectiveness of our model, including cross corpus evaluations that compared its performance with 9 deep transfer learning methods for face mask detection and 8 models for masked facial recognition. To make the task of the guards easier, we will later add heat detection to this gadget. Additionally, it is hoped that this device will be put in additional crowd areas that require face mask detectors.

We could also use a GSM module to connect it to our project, and with its assistance, we could send an alert message or make a call whenever someone tries to enter the building without a mask. Therefore, it would make the job of the security guards easier because it would alert him immediately if anyone tried to enter without a face mask; otherwise, everything is OK and he is not need to stay at the entrance all the time.

Therefore, it should be taken into consideration to combine the first and second stages into one model in the future and to develop a unique algorithm that searches for faces both with and without masks. This eliminates the requirement to distinguish between faces with and without masks before using the Open CV face detector. The model will become more resilient as a result of the even further decreased processing time. The best model and network trained in adverse evaluation conditions should be determined by conducting a comparison examination of the models utilised for learning transfer in the future. The finished models can be compressed after training and installed on inexpensive embedded systems like Raspberry Pi or mobile devices.

8.PROBLEM STATEMENT

The world has been in total lockdown since the beginning of 2020 as a result of the COVID-19 epidemic. Millions of people have been directly and indirectly impacted by the virus. People have lost their jobs as a result of the epidemic, healthcare personnel are overworked, the global economy is precariously balanced, and the virus is still spreading at an alarming rate. Additionally, people are breaking the quarantine's laws and regulations, which is contributing to the outbreak's rapid growth.

As a result, we have developed the concept of a "AUTOMATIC GATE BASED ON FACEMASK & TEMPERATURE DETECTION" that can be used to verify every person entering a crowded

area, such as a mall, office, or school, whether they are wearing a face mask or not. Only after our algorithm has verified this, would the gate or doorway open. The ultimate goal of this initiative is to stop the spread of COVID-19 and to make life easier and more productive for frontline soldiers so they can spend more time with their loved ones.

9.BLOCK DIAGRAM

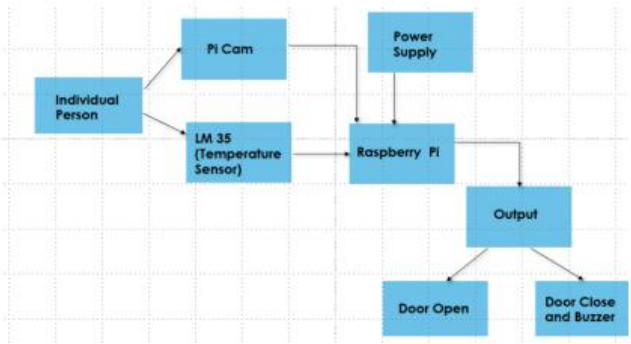

FIGURE-9 Block Diagram

The data would then be sent to the Raspberry Pi, which would process it and display the information on the LCD, letting us know whether the person is wearing a face mask and what their ideal body temperature is, which is between 90 and 100 °C. So, as you can see, we have sensing components that can actually measure the temperature and detect the face mask of any person.

The gate will open if the user is wearing a face mask and has a body temperature below 100° C; otherwise, the gate will remain closed.

There are two codes:

a. [python - code] for Raspberry Pi programming.

b. Python code for mask detection.

10.Work Flow:

Before anything else, we must install all the relevant components. For instance, the Raspberry Pi module inside Proteus and the LM35 temperature sensor

The circuit should then be included to your proteus programme, and then we would write in accordance with the specifications needed to operate the circuit.

Once the python code for face mask detection was built, we entered the code's output into the proteus programme, which serves as one of the inputs for the proteus circuit, and when the simulation was run, the output appeared on the LCD.

11.COMPONENTS REQUIRED

Hard Ware Component's used in proteus

1. Raspberry Pi.

2. COMPin.

3. LM016L – LCD.

4. Temperature {LM35}&Buzzer.

5. L293D comparator.

6. Servo Motor.

II. Software Tools

1. TensorFlow.

2. PuTTY.

3. OpenCV.

4. Virtual Serial Port Emulator

12.1 COMPONENTS DESCRIPTION

Hard Ware Component's

The Raspberry Pi is an open source computer that runs Linux (a number of versions). Its primary supported operating system, Pi OS, is also open source and makes use of a number of open source applications. Since the Raspberry Pi's 2012 debut, numerous updates and tweaks have been made and published. The newest Pi model has a quad-core CPU that clocks in at over 1.5GHz and 4GB RAM, whereas the original Pi had a single-core 700MHz CPU and just 256MB RAM.

FIGURE-10 Raspberry Pi

12.2. COMPin

Physical COM interfaces are represented by COMPIM in Proteus. Before presenting serial signals to the electrical circuit, it captures and buffers them. The computer's serial ports will be the conduit for all serial data flowing from the CPU or the UART model. Virtual serial ports can be created using a variety of technological methods that leverage USB or Bluetooth connectivity. It is possible to convert baud rates when using the COMPIM model.

Software can be used to verify the device's virtual and physical features with the inclusion of additional hardware.

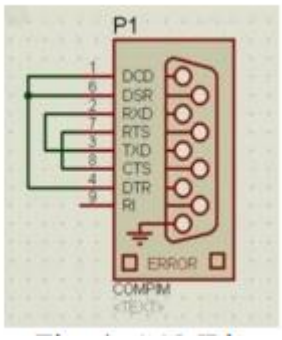

FIGURE-11 COMPin

12.3. LM016L

The mospopular LCDs on the market right now are 1 Line, 2 Line, or 4 Line LCDs, which have just one regulator and can support up to 80 characters. Most LCDs with one regulator have 14 Pins, while LCDs with two regulators have 16 Pins (two pins are extra in both for LED connections for the background illumination).

FIGURE-12 LM016L

12.4. Temperature {LM35} SENSOR

With output voltages that are directly proportional to the temperature in Celsius, the LM35 series of integrated-circuit temperature sensors are precise (Centigrade).The LM35 is rated to operate between 55 and +150 C, whereas the LM35C is rated to operate between 40 and +110 C (10 with improved accuracy).

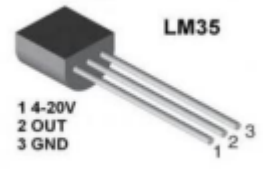

FIGURE-13 Temperature {LM35} SENSOR

12.5. Motor

By sending a coded signal to the output shaft of a servo motor, the output shaft can be adjusted to a precise angular position. The main difference between servo and stepper motors is how feedback is used. A position encoder is connected to the drive motor of a servo motor and communicates to the motor controller the precise position of the motor shaft.

As a result, the servo controller may correct positioning errors whenever they occur.

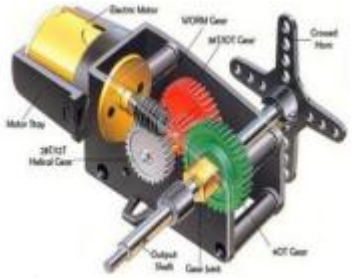

FIGURE-14 Servo Motor

12.6. Buzzer

An auditory signalling tool called a buzzer makes sound when a command is received. It could be piezoelectric, electromechanical, or mechanical in nature. It is frequently used in alarm clocks, timers, and/or receiving input confirmation messages and is powered by DC voltage.

FIGURE-15 Buzzer

12.7. L293D comparator:

In order to determine which of two voltages or currents is greater, a comparator compares the two and outputs a digital signal. It has one binary digital output and two analogue inputs. The outcome is flawless.

FIGURE-16 L293D Comparator

13.1 Software Tools

TensorFlow

is a library of open source, free machine learning tools. It was created to carry out large-scale numerical computations without taking deep learning into account. Although it can be used for many different things, this tool is primarily meant for deep neural network inference and training. Additionally supported is conventional machine learning. Google created the Python package TensorFlow to facilitate quick numerical calculations. TensorFlow is used either directly to create deep learning models,

either by using wrapper libraries created on top of TensorFlow, which is also a basic library, or by using the process itself.TensorFlow accepts inputs as a multidimensional tensor array and uses those inputs to build dataflow graphs and structures that control how data flows across the graph.

13.2 PuTTY

A serial console can be connected to a serial port using this open-source application. Users can access the Raspberry Pi's command-line interface from any laptop or desktop computer using PuTTy, a terminal emulator. Using SSH (secure shell), which generates a terminal window on the laptop or device, it is possible to direct the Raspberry Pi and get data before it is transferred to the computer. Putty can open files in the primary Ikey file format, known as ppk. Raspberry Pis are often used as lightweight, portable network computers.The Raspberry Pi is linked to the same local network as the remote PC.

13.3 OpenCV

This library for computer vision is open-source. It enables the machine to recognise faces or objects. In this session, the Python programming language will be used to examine the idea of OpenCV. Since Python is simpler to build than C/C++, the code is just as quick as the original C/C++ code because it is actually running C++ code in the background. OpenCV's original C++ implementation is wrapped in Python by OpenCV-Python.

13.4. Virtual Serial Port Emulato

is a piece of computer software that mimics real COM ports. The resulting virtual serial ports are completely compatible with operating systems and programmes and are treated just like real serial ports.

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