SMARTSIGN: RASPBERRY PI-BASED REAL-TIME SIGN-TO-SPEECH CONVERTER FOR THE MUTE COMMUNITY

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ABSTRACT

Sign language plays a crucial role in communication for the mute community, yet they often face challenges in conveying information to those unfamiliar with it. To address this, we propose an advanced sign language conversion system using a Raspberry Pi microprocessor, enabling seamless and intelligent communication. This system is particularly beneficial in emergencies, allowing mute individuals to convey essential messages effortlessly. Our approach involves two key components: sign-based data conversion and a voice generation system. An OpenCV-integrated camera captures sign gestures, which are then processed by the Raspberry Pi module for rapid conversion into voice output via a 3.5mm audio jack. This real-time translation enhances accessibility, enabling effective interaction between mute individuals and the general public. The system is designed to be highly efficient, ensuring fast and accurate interpretation of gestures into speech. By leveraging microprocessor technology, this innovative solution simplifies communication for the mute community, individuals with physical disabilities, and elderly people, empowering them to share their thoughts and needs in any situation.

Keywords: Raspberry Pi, sign language, speech conversion, mute community, microprocessor, openCV, camera, voice generation, data transmission, communication, accessibility, assistive technology, physically disabled, elderly, emergency situations.

1.1 INTRODUCTION:

Human communication primarily relies on speech, but not everyone has the ability to speak or hear. For the mute and deaf community, sign language serves as a vital mode of communication, enabling interaction through hand gestures, orientations, movements of the hands, arms, or body, and facial expressions to convey thoughts fluently. Mute individuals use sign language to communicate with others who are also vocally impaired, as well as with those who understand sign language. However, many people do not know sign language, making communication challenging without an interpreter. While interpreters help bridge the gap, it is not always feasible to have one available at all times. This limitation highlights the need for an automated system that can accurately translate sign language into speech, enabling seamless interaction between mute individuals and the general public. By leveraging advanced technology, such a system can eliminate communication barriers, ensuring that the mute community can express themselves effectively in any situation without depending on a human interpreter. Impaired people are everyone genuinely or simple-minded. A Dumb and old age individuals goes up against such an assortment of issues in the overall population. Impaired in the sense it is the state of weakness what's more, moreover it suggests the limitations experienced by the impaired individual in relationship with the activities of the health of practically identical age and sex. This paper points to bring down the obstacle in correspondence. It relies upon the need of working up an electronic device that can make a translation of motion based correspondence into discourse in order to make the correspondence between the quiet bunches with by and large populace possible. Movements of the hands are identified by the glove for Dumb individuals and it will be changed over into voice so common people can grasp their look movement in a motion-based correspondence is a particular advancement of the hands with a specific shape made out of them and it sends email to concern

individual of moronic and visually impaired individuals predefined pictures. In existing frame work we utilized MEMS Accelerometer for movement identification of quiet individuals. In the square chart we will have the segment like MEMS accelerometer ADC converter, microcontroller, speaker, Arduino. Accelerometer sensor utilized for identifying the hand movement. Accelerometer actuator acts as position, that point their voltage additionally changed. Accelerometer sensor depends on variable resistance it acts as sensor high and low. This information is straightforwardly given to Arduino. In this existing system accuracy of data transfer system is very less and its complex integration of audio speaker connection and consume huge power. To avoid this we proposed new sign conversion system using raspberry.

2.LITERATURE SURVEY

Wolf, C. G. Will [1] In all around the globe about 9.1 billion individuals are hard of hearing and idiotic. In their day by day life they face a lot of issues on their correspondence. It is perceived that in excess of a half of our mind is committed to the understanding of what we see, making the sight the most prevailing sense.

Sanna K. [2] In this paper, motion acknowledgment that assumes a key job. Proposed paper incorporates a brilliant glove that interprets the Braille letter set, which is utilized generally by the proficient hard of hearing visually impaired populace, into text and the other way around, and imparts the message by means of SMS to a distant contact. While it's simple for the Deaf to impart among themselves utilizing hand signs, the overall population regularly finds it hard to follow these motions.

WII Nintendo [3] Mediators who have aced the methods associated with Sign Language are continuously required in such cases. The speak module, a minimal, open source, programming discourse synthesizer for Raspberry pi is used which changes over the predefined text to discourse. The produced codes even relate to activities like turning on the fan, lights and so forth.

Malik [4] A vibration sensor is associated as a wrist band to the client at whatever point the doorbell rings, the sensor vibrates, which tells the client. The essential point of this paper is to present an issue that will proficiently interpret language signals to each text and reasonableness voice. Regularly daze individuals have an issue in recognizing their current area. So to support them, the Raspberry Pi is associated to the glove has a GPS module which recognizes the scope what's more, longitude. The location comparing to those qualities are discovered utilizing the decoder's module of python. Once again the Speak module changes over this location into discourse or then again sound yield.

Rithesh M Nanda1 [5] Signal acknowledgment is classed into a couple of principle classifications: vision based for the most part and locator based. conceived a gadget for the hard of hearing visually impaired clients that can utilize the glove to convey messages to other clients, utilizing the Malossi letters in order. The characters (and phrases) along these lines made, will be sent to the android application and shown or heard through discourse.

Jia, P. furthermore [6] In the past, many techniques have been used to convert the hand gesture to text. However, they were limited in terms of their functionalities. Many techniques required gloves with sensors which not only made the application more complex but also expensive. In the other version, the system was limited to a particular background without any noise or disturbance. There were some projects which were heavily dependent on heavy GPUs making it difficult for common man to use the system. Additionally, there were some systems for detections which required the object to be of a particular skin colour. Although, there have been various techniques for converting the hand gesture to text but a very few focus on converting the gesture to both text and speech with that too with limited properties.

Juha K., Panu K [7] About nine billion people at intervals the planet unit of measurement dumb. The communication between a dumb and hearing person poses to be an important disadvantage compared to communication between blind and ancient visual people. This creates an extremely little house for them with communication being associate degree elementary aspect of human life.

Pooja Dongare1[8] The blind people can speak freely by implies that of ancient language whereas the dumb have their own manual-visual language referred to as language. Language is also a non-verbal form of intercourse that's found among deaf communities at intervals the planet. The languages haven't got a typical origin and thence hard to interpret. A Dumb communication interpreter is also a tool that interprets the hand gestures to sensibility speech. A gesture in associate degree extremely language is also a certain movement of the hands with a particular kind created out of them. Facial expressions collectively count toward the gesture, at constant time. A posture on the other hand is also a static variety of the hand to purpose an emblem. Gesture recognition is classed into a pair of main categories: vision based mostly and detector based. The disadvantage of vision based totally techniques includes advanced algorithms for process. Another challenge in image and video method includes varied lighting conditions, backgrounds and field of scan constraints and occlusion. The detector based totally technique provides larger quality.

Solanki Krunal M [9] The primary aim of this paper is to introduce an issue that will efficiently translate language gestures to every text and sensibility voice. The interpreter makes use of a glove based totally technique comprising of flex detector, instrument sensors. For each hand gesture created, a symptom is formed by the sensors appreciate the hand sign the controller matches the gesture with pre-stored inputs. The device not exclusively interprets alphabets but cans even sort words exploitation created gestures. A training mode is gettable on the device therefore it fits every user and accuracy is inflated. The device will even be able to translate larger gestures that require single hand movement. Gesture recognition implies a method by that knowledge is collected from parts of the physical body (usually the hand) and processed to work out attributes like hand form, direction and speed of gesture being performed. There are presently 2 sorts of answer. Device based mostly techniques involve some variety of guide like a glove or glove like framework fitted with position trackers and flex sensors to live the condition and position of the hand. Visual based mostly techniques use camera chase technologies, whereby usually the user wears a glove with specific colors or markers indicating individual parts of the hands, specially the fingers. The cameras record the everchanging image and position of the hand because the user signs and also the pictures are then processed to retrieve the hand form, position and orientation.

Abhijith Bhaskaran, et.al.[10] proposed the method of hand gesture recognition using smart gloves. The proposed idea is the smart gloves technique for recognition of hand gesture. The proposed idea in this system is a smart glove technique which converts sign language to speech or voice output. The smart glove consists of an Inertial Measurement Unit (IMU) and flex sensors to recognize the gesture. A state estimation method has been developed to track the motion of hands in three-dimensional space. Flex sensor is used to track the fingers orientation. This prototype has been tested for its feasibility in conversion of Indian sign language to speech output. The glove is a multipurpose glove that can be used in various fields like gaming, robotics and medical field even though it is intended for sign language to speech conversion. The drawback of this system is life of sensor like gadgets is limited.

3.PROPOSED SYSTEM

The proposed sign conversion system is integrated of both hardware and software. This system used open cv based finger gesture sign, audio speakers and Raspberry Pi 4 model microprocessor, regulated power supply section for sign conversion system using python programming.

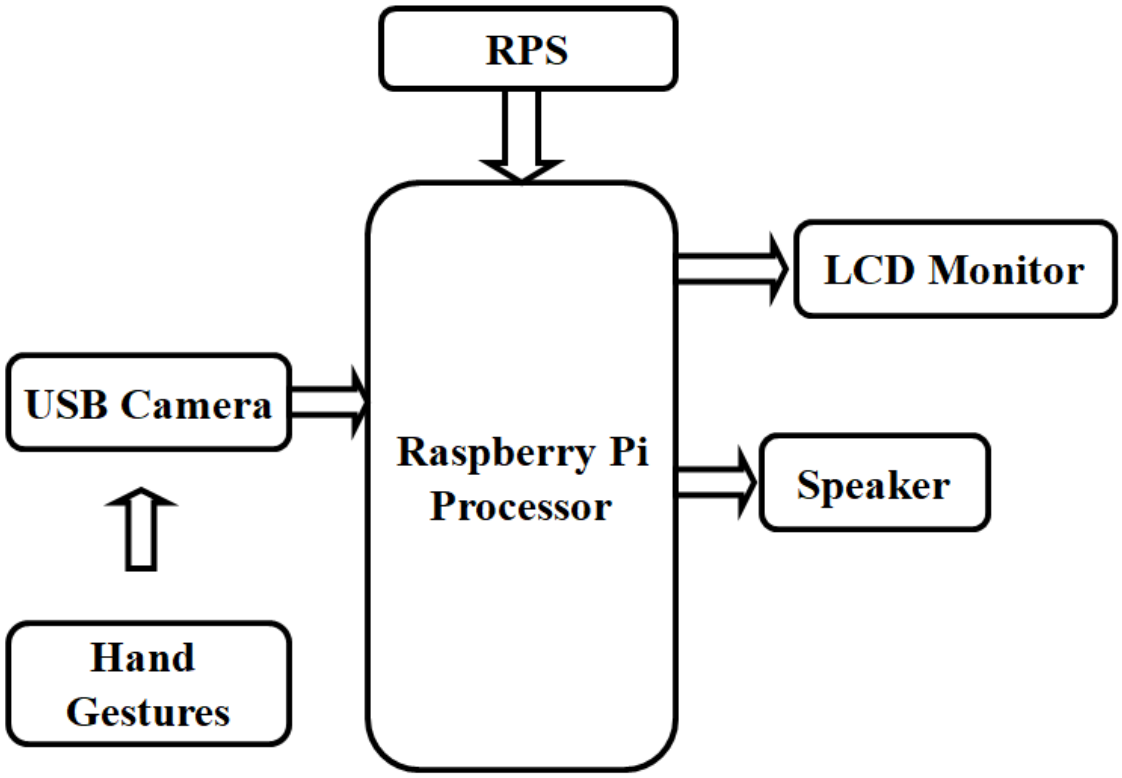

Fig.1.Block diagram

Working:

Microprocessor is the integrated of all input and out modules for processes the data every individual sensor finds the respective parameter of data gives to the processor. By using usb camera we are showing the gestures the raspberry pi processor recognize the gestrure and provide the sufficient voice through audio speakers.This output voltage reads by the microprocessor with the help of python scripting language controls the output modules. 3.5mm audio jack used as voice generation circuit for proper sound. We used four gesture sign for 4 parameter alerts through voice. When you show B symbol activated displays I need water on LCD monitor and same thing will be voice converted trough speakers. When you show Y displays I need food massage on LCD monitor and same thing will be voice converted trough speakers. When you show C symbol activated displays I need medicine massage on LCD monitor and same thing will be voice converted trough speakers. When you show L symbol activated displays please help for washroom massage on LCD monitor and same thing will be voice converted trough speakers.

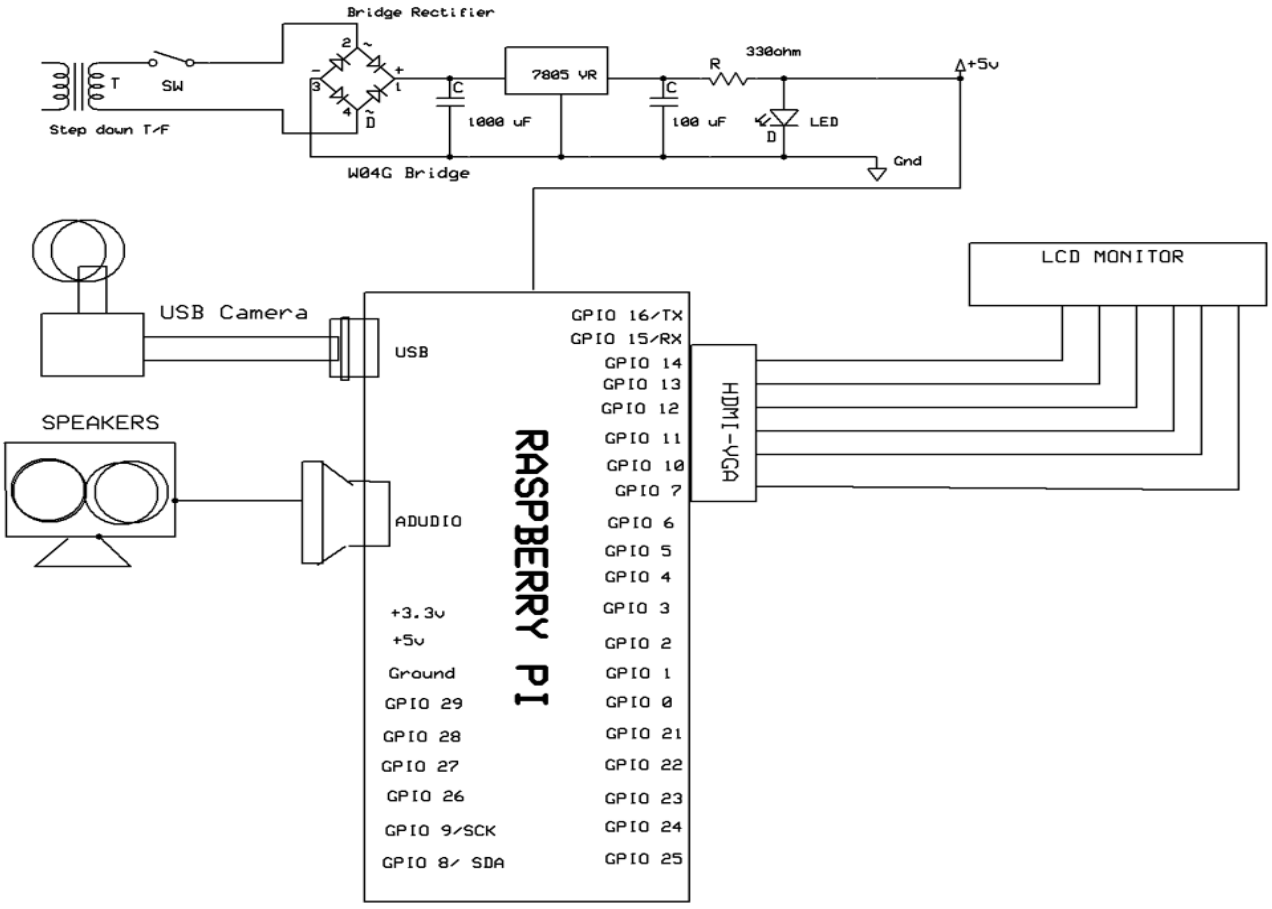

Fig.2. Schematic diagram

4.RESULTS AND DISCUSSION

Figure 7.1 shows the two pictures where in one of the picture where we find the sign language of the letter 'W' and in the command window we can notice there is a need of the sign language .so the 'W' represents the "HELP FOR WASHROOM".

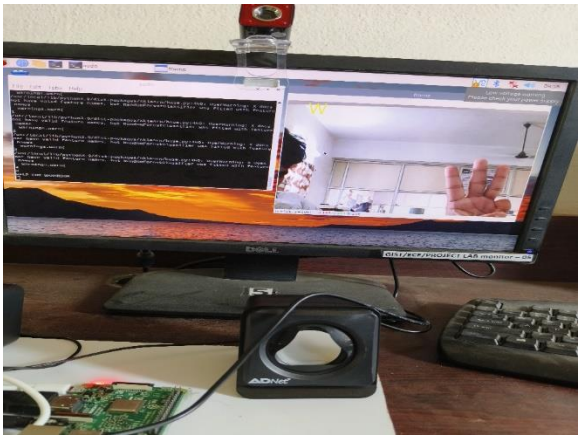

Figure 7.1

Figure 7.2 shows the two pictures where in one of the picture where we find the sign language of the letter ‘F’ and in the command window we can notice there is a need of the sign language .so the ‘F’ represents the “REQUIRE FOOD”.

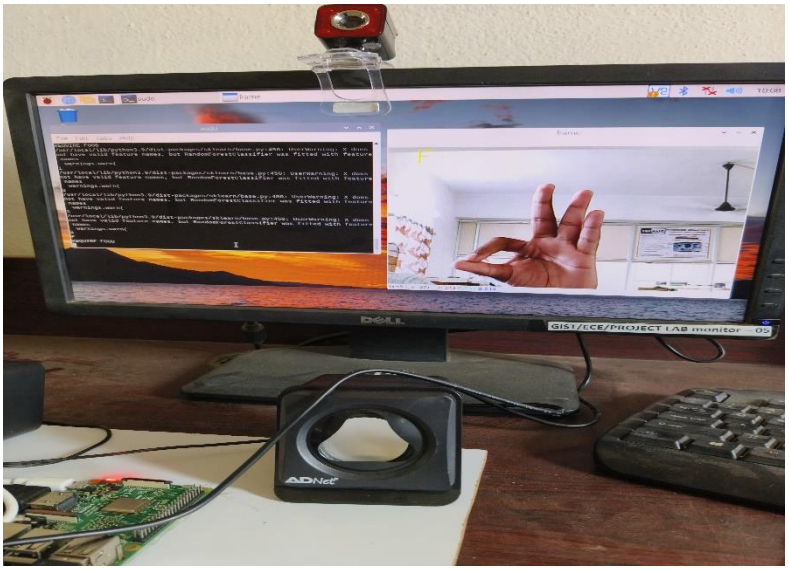

Figure 7.2

Figure 7.3 shows the two pictures where in one of the picture where we find the sign language of the letter ‘B’ and in the command window we can notice there is a need of the sign language .so the ‘B’ represents the “NEED WATER”.

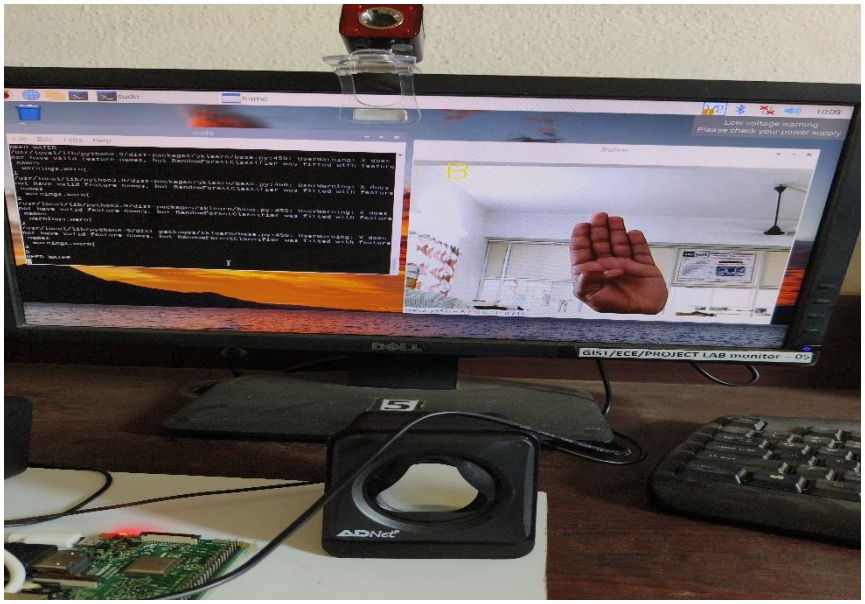

Figure 7.3

Figure 7.4 shows the two pictures where in one of the picture where we find the sign language of the letter ‘A’ and in the command window we can notice there is a need of the sign language .so the ‘A’ represents the “NEED MEDICINE”.

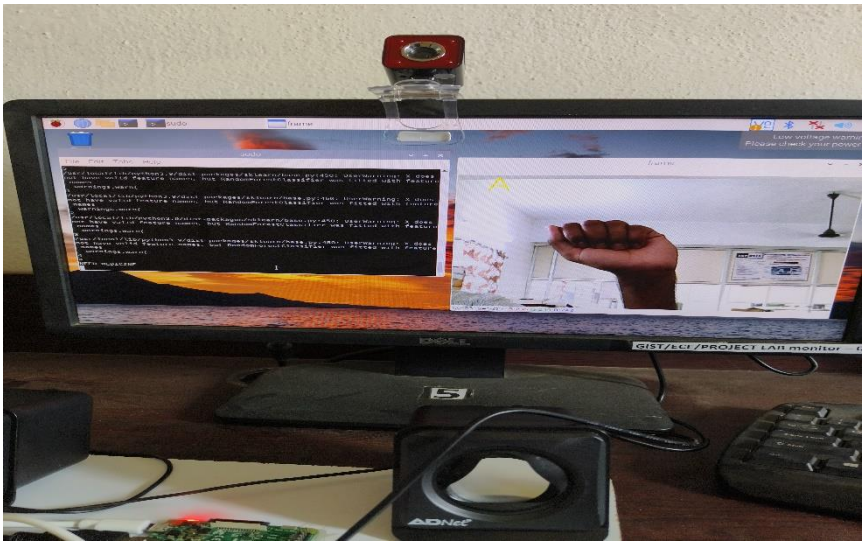

Figure 7.4

Figure 7.5 shows the two pictures where in one of the picture where we find the sign language of the letter ‘Y’ and in the command window we can notice there is a need of the sign language .so the ‘Y’ represents the “EMERGENCY”.

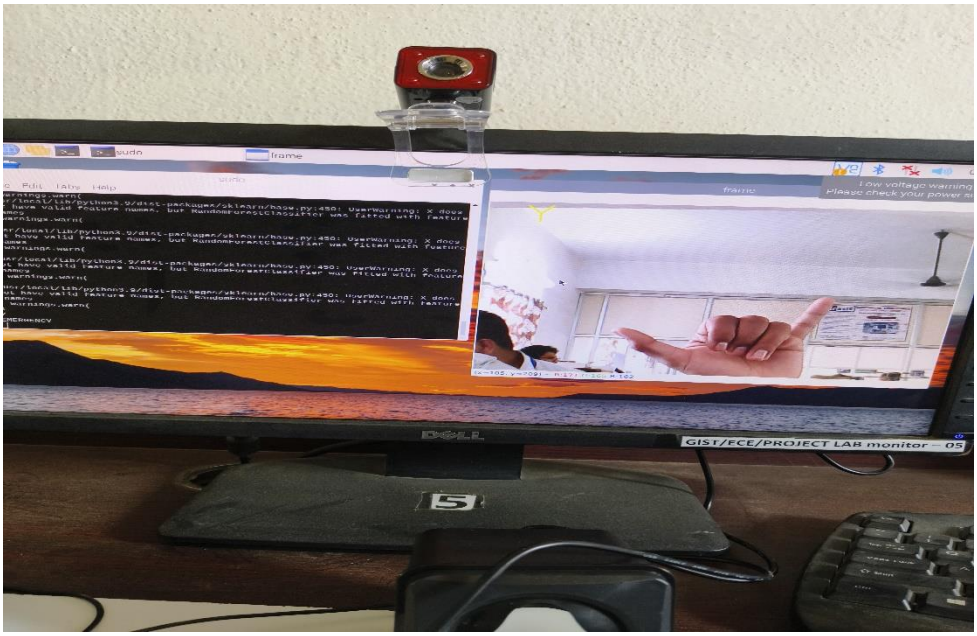

Figure 7.5

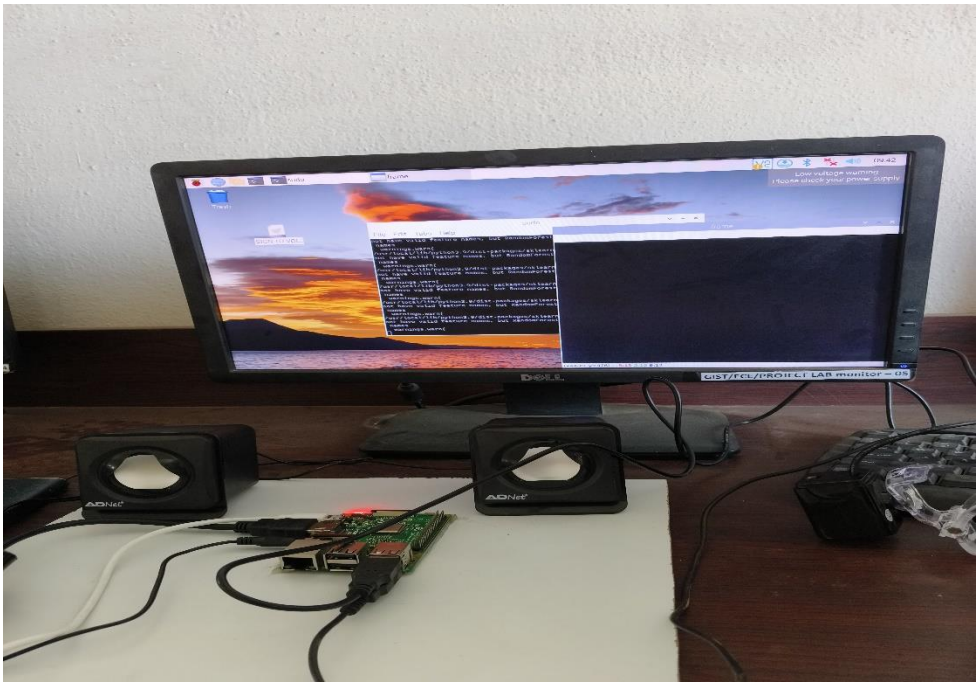

Figure 7.6

Figure 7.7

5.CONCLUSION

We implemented and constructed sign to speech conversion system using raspberry pi done successfully in this proposed system we integrated all input modules and output modules to the Raspberry Pi Micro processor. We obtained results accurately. This proposed system proves that this is efficient system than existing one. Open cv based gesture to voice conversation and their output is reviewed in LCD module and Audio speakers effectively.

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