

Communicational Aiding System for Mute People

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ABSTRACT:

People with abnormalities find it difficult to meet the fast growing technologies is one of the worrying facts in our community. Communication has become one of the most essential part in our day to day life. People with abnormalities faces issues in communication. They can't communicate with each other normally. They use sign language to express their thoughts and feelings. Not all the normal people know the sign language. To reduce this communication gap, this communicational aiding system is proposed. This system captures the sign made by the mute people. This image is then processed and the corresponding word is obtained from the pre- trained datasets. This word is then converted to audio using Text to Speech (TTS) which is then obtained from speaker interfaced with raspberry-pi. Few more new signs are trained as emergency signs. When these emergency signs are used executed by the mute people, the emergency is notified to their relatives or servicemen (like policemen, fire engine service, ambulance service) via sms/email. This helps them to communicate their difficulty to their relatives/servicemen and this makes them to get rescued from their difficulty situations.

INTRODUCTION

People gain knowledge about science and technologies, environment and also know about each other by conveying what they know, their ideas, the challenges they faced, the experiences they have. There are several ways of implementing the communication, the best among the ways is 'Speech'. With the use of speech, one could easily receive and transfer the ideas of one another. But the people with abnormalities like the inability to hear or speak can not be left as they are. These people uses Sign Language for their communication. By using these Sign Languages the mute people are restricted to convey their feelings as well as with the reduced part of the world where the humans know these Sign Languages.

This barrier restricts the mute people from communicating with everyone in the global earth to convey their difficulties, ideas, feelings, and their capabilities. We can see people who are normal learning sign languages very rarely. These factors increases the barrier and communicational gap between deaf as well as mute persons from the common society. Technology is one way to remove this barrier and make the communication better for these people. Recognition of hand gestures provide an intelligent way of human computer interaction (HCI).

Human Computer Interaction (HCI) is an order of logical man-made brainpower that concentrations with the improvement of calculations that get contribution as exact information from data sets or sensors, and produce forecasts thought or examples to be normal for the hidden cycle that creates the information. A fundamental point of HCI research is the making and advancement of calculations that finds and work on complex examples and settle on AI choices dependent on input information. The interfacing of advanced cameras with the PC machines turning into the roaring innovation, the odds of making more Human Computer Interfaces are expanded. Acknowledgment of hand motion is an extension in software engineering and language innovation that concentrations in clarifying human motions through numerical calculations. With the acknowledgment of motions, it is possible for us to discuss normally with frameworks. There are different sorts of signals that can be utilized by us. Yet, the most well-known and expressive method of signal is motions made by hand.

PROPOSED SYSTEM

We propose a system to overcome the communication gap between deaf-dumb people and normal community people called Communicational Aiding system for mute people which will be very helpful to them for communicating their ideas and thoughts to others. Mute people can make hand gestures with the help of their fingers and these signs are then converted into speech so that normal people can understand their expression. Also during the emergency situations using respective hand gestures in front of the system makes their relatives/servicemen know about their difficulties.

This paper introduce and explains about the system that overcomes the problem faced by the deaf and mute people. The objectives of these systems are as follow:

1) To design and build a system that reduces the communication barrier between deaf mute people and normal people.

2) To convey their emergency situations to their relatives/ servicemen through the sms / email.

3) This communicational aiding system (fig.1 Block diagram) comprises of four steps .

Step 1: Image Acquisition

Step 2: Pre-processing

Step 3: Feature Extraction

Step 4: Classification

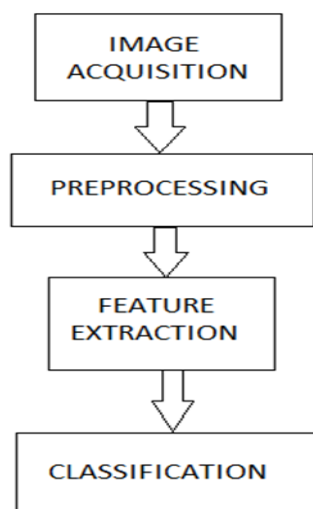
Methodology:

The communicational aiding system uses deep leaning and openCV python for processing the images (signs captured by camera). Initially the signs are captured as a set of different angles and then trained. After the completion of training datasets, the system is ready to test. The image of sign language captured by the camera is recognized from the trained datasets. The output is then obtained as audio using Google Text-to-Speech (gtts). Here we introduce few emergency situation signs and are trained. If they are in need of any help from their relatives are servicemen then they can use the respective emergency signs. In case the sign detected is the emergency sign, then the emergency message is conveyed to the relatives or servicemen through sms/email. The emails are sent to the respective servicemen/relatives using the smtp(simple mail transfer protocol) library. Image-processing consists of four main steps.

A. Image Acquisition:

It is the process to capture the hand gesture made by the fingers. The captured images which denotes different signs of the sign language. The images captured by the different capturing sources or devices would not the same resolution. This out-turn in varying resolution of the images that are captured. The captured images must be scaled to same size for the precise comparison of feautres and to minimize the computational effort required for processing. Images captured for training as well as testing are captured with white background with the help of web camera or capturing devices. These captured images are used creating database. When we provide the test images to the system, it recognizes the signs.

FLOWCHART:



B. Pre-processing:

Pre-processing is the main advance in the picture preparing errand to perceive the hand signals. The extraction of highlights of the pictures of hand signal is done solely after that pictures are pre-handled. The essential point of picture division is autonomous area apportioning of picture to a bunch of disjoint districts that are diverse in visual, homogeneous and critical concerning a few attributes or assessed PC calculation then again is very hard. The picture division results are an assortment of districts that cowl the total picture along and a total of forms separated from the picture. The entirety of the pixels in an extremely district are homogenous with connection to certain attributes like tone, power, or surface. Nearby areas are altogether totally unique with connection to the indistinguishable uniqueness.

Division is that the grouping of the info shaded picture into skin and non-skin pixels upheld on skin shading information. A broad extent of utilizations that require the division strategy as a preprocessing activity like face/hand discovery and acknowledgment, design acknowledgment, PC vision and clinical picture investigation. Shading information is one among the direct signs utilized for perceiving skin tone, and hence the utilization of right shading space to depict shading data of a picture is a vital choice. The determination of relevant division procedure relies upon the framework climate just as applications. The division calculation's presentation is measured utilizing not many benchmarking like accuracy coefficients and review, else by assessing the right rate and bogus discovery rates in sync with the method composition utilized.

C. Feature Extraction:

Great division strategy brings about exact highlights extraction technique and furthermore the later assume a vital part during a beneficial acknowledgment strategy. There are a few entrancing focuses on each item which could be separated to supply a component portrayal of the article. Sectioned picture's highlights vector will be removed from multiple points of view as per express application. The exhibition of different component identifiers will be extensively extraordinary under various conditions. The foundation's tendency, presence of extra items (impediment), and light ought to be considered to discover what sort of highlights could be trustworthy and proficiently distinguished. Highlight extraction is a cycle of limiting information spatial property by encoding associated data in an extremely packed representation and eliminating decreased discriminative data. Highlight extraction is significant for the presentation of acknowledgment of signals. The decision of which highlights to adapt to and the system of extraction are conceivably the main plan choices in the development of hand and acknowledgment of motion improvement.

D. Classification:

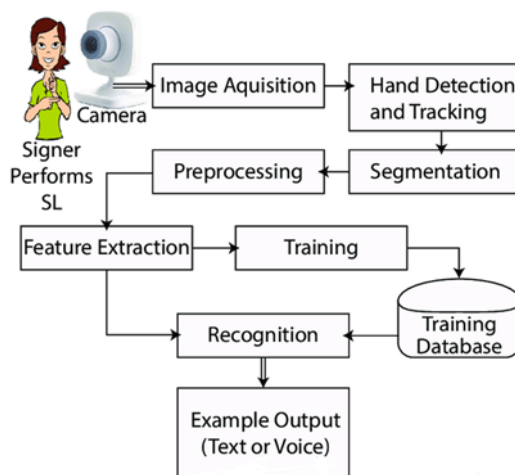
Classifying two different objects is simple work for human beings. But this classification of different objects has been proven to be a problem for machines with high complexity. The evolution of high-capacity machines and systems, the accessibility of affordable priced and high quality digital cameras, and the emerging requirement for automatic video analysis have created a regard in the algorithms of classification of objects. An essential arrangement framework includes a camera fixed raised over the intrigued zone, where we are in need of capturing the images and these images are processed consequently. Classification involves the process of image sensors, pre-processing of images, detection of object, object segmentation, feature extraction and classification of object.

Classification system also comprises of database that carries the predefined patterns that differentiate the objects that are detected and also to classify in to appropriate categorization. Classification of image is a vital and challenging function in numerous domains of application, that includes robot navigation, bio-medical imaging, surveillance using video, biometric machines, vehicle navigation, industrial visual inspection, and remote sensing. Classification of image is potentially the most fundamental part of computerized examination of picture. Distantly detected information order is useful in the task of individual levels in understanding to bunches with homogenous attributes, with the focal point of segregating numerous items from each other inside the picture. This level is named as class. Classifications are implemented on the spectral base or spectrally defined features, like texture, density, etc. in the feature space.

This communicational aiding system for mute people is used based on the image processing which follows these steps. The images are captured by the webcam. This camera module continuously captures the live streaming. When the sign language is performed in front of the camera, the image of the hand is processed as shown in the Block Diagram fig. 1.

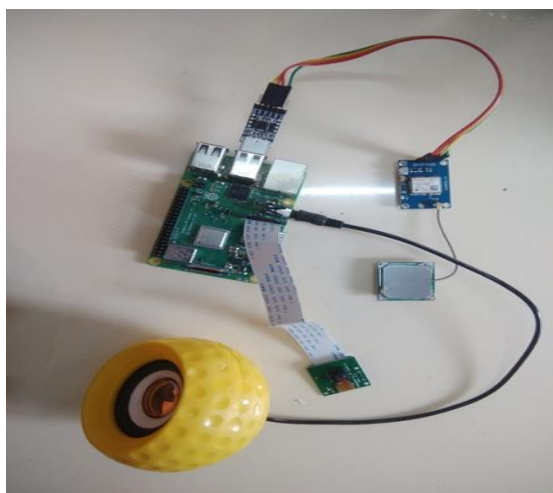
Initially the system are trained with images known as training datasets. Then the recognition part comes under the testing datasets. The Block diagram of this communicational aiding system given below.

BLOCK DIAGRAM:



Block Diagram fig 1

HARDWARE UNITS:



RASPBERRY PI:

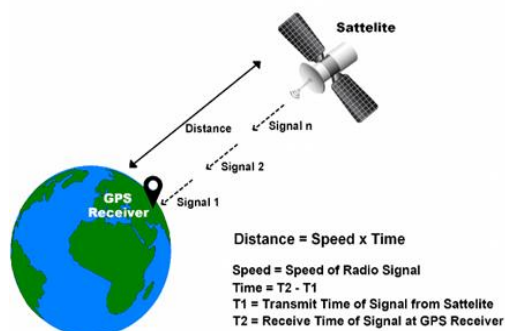
Raspberry pi is a small sized computer which looks like a credit card. It includes multicore processor, GPU, DDR RAM memory, ROM, I/O Peripherals, Ethernet port, USB host, very small HDMI on that. The Raspberry Pi is comparatively slower than our modern days computer as well as laptops, but it can fulfil the expectations from a proper Linux system with the consumption of low power levels. It has the capability to communicate to the outside world, and has been employed in various field of digital maker projects, music machines, weather stations and tweeting birdhouses with infra-red cameras. It is an open hardware. Most of the projects using raspberry pi are open and that can also be built as well as modified by ourself. It is used to process the image captured by the camera.

Pi CAMERA:

The Pi camera module is a portable weightless camera that supports Raspberry Pi. With the use of MIPI camera serial interface protocol, the pi camera communicates with the raspberry pi. It captures frames and have those frames in computerized process. Pi camera have evolved with various other versions that can support image as well as audio recordings.

GPS MODULE:

Global Positioning System is used to calculate its position on earth with help of ground stations and satellites. The position of GPS module on earth is determined based on the distance between this GPS module and GPS satellite. This distance between GPS module and GPS satellite is calculated based on the time taken by the GPS receiver module to receive the signals that are sent by the GPS satellite.



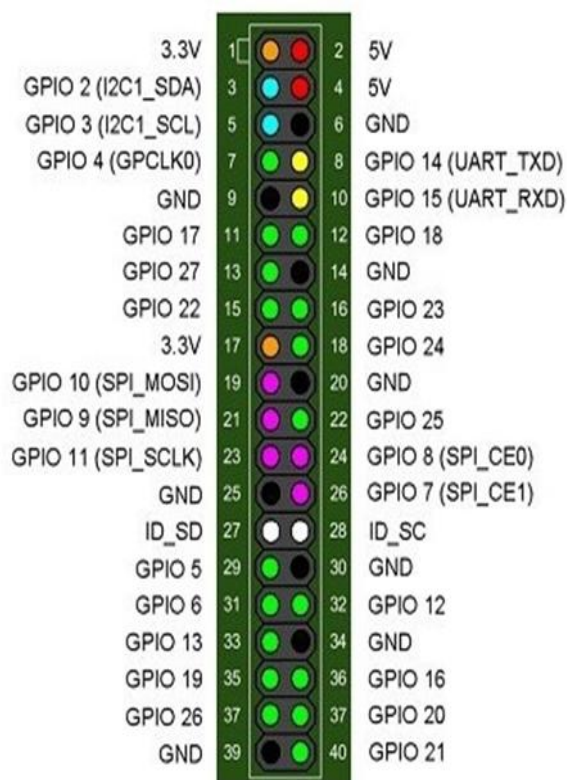
Here the speed of the signal is approximately equal to the speed of light.

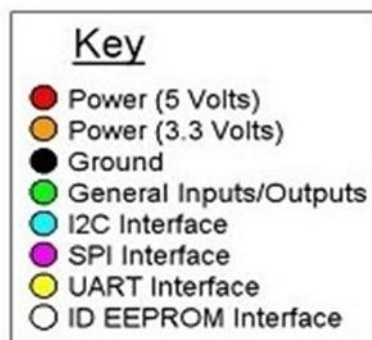
The speed of light = 3×10^8 m/s

Time here indicates the total time the signal traversed. This time is calculated by subtracting the time at which the signal is sent by the satellite and the time at which the signal is received by the GPS receiver module.

MERITS OF THE PROPOSED SYSTEM:

- This communicational aiding system is used as a communicational tool for the mute people.
- It is used to convert their signs into text or audio format.
- It is also used to convey the emergency messages to their relatives or servicemen through email/sms.

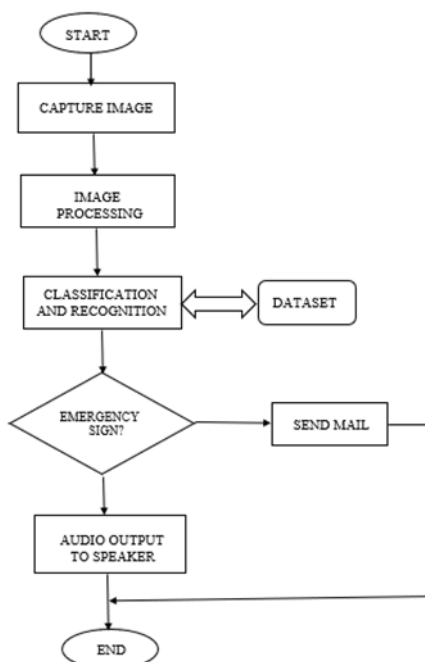
PINOUT DIAGRAM OF RASPBERRY PI



The voltage level of GPIO is 3.3V. It is not good tolerant of 5V. Over-voltage protection is not available on the board. Hence we have to use an additional board with buffers, conversion of levels and analog input/output. It is not advised to directly solder to the main board without this kind of external board. GPIO pins ie., general purpose input output pins can be used to provide various functions, SPI, PWM, I2C and so on. After resetting the 14th and 15th GPIO pins are made to perform the function as UART. These two pins can also be made to provide the service of GPIO. Including these two pins, there are totally 17 GPIO pins. The functions of every GPIO are to interrupt, rise/fall or high, low. GPIO input hysteresis ie., Schmitt trigger can be on/off, yield of slew rate can be quick or restricted, and source and sink current is configurable from 2 mA up to 16 mA. GPIO pins 0-27 in the board are in a similar block. The functions or properties are assigned as per block and not as per pin. Certain contemplation should be concerned to SSO (Simultaneous Switching Outputs). This could be helpful in avoiding interference, driving currents are to be maintained as low as possible.

We should be careful while using the 5 V pins P1-02 as well as P1-04. Raspberry Pi will be permanently damaged if we sort 5V to a different P1 pin. It is advised to strip short pieces of insulation off a wire before probing P1.

WORKING FLOWCHART:



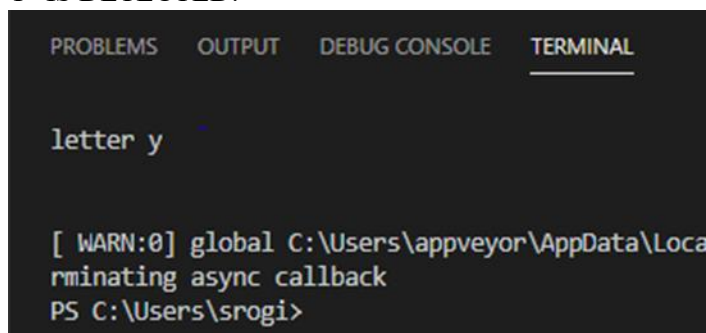
TRAINING DATASETS FOR LETTER Y:

Training datasets with different angled hand with different backgrounds make the system to learn about the signs more accurately. Hence several images are taken and trained for each and every signs. This makes the system to easily differentiate between different signs.



After training all the datasets, the system is ready to get tested. OpenCV is used to turn on the camera and is used to capture the frames of the live streaming video. When the sign for letter 'y' is recognised by the system, then the output is displayed as shown below. The output is also converted to audio with the help of Google Text-To-Speech (gTTs) and is played through the speaker.

OUTPUT WHEN SIGN OF 'Y' IS DETECTED:

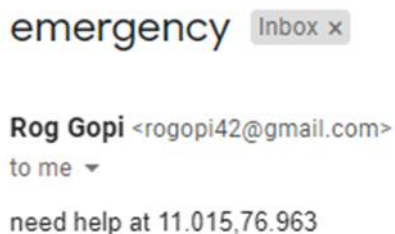


EMERGENCY SIGNS:

Here we introduce few emergency signs (ie., new signs introduced for different emergency situations) that makes them to communicate to their relatives or respective servicemen through the email. These emails are generated through smtp(simple mail transfer protocol) library.

Different emergency signs should be introduced for different needs. In case, if the mute people come across a theft or any emergency situation in which the help of policemen is required, then the mail is sent to the policemen. If they come across any accidents, respective emergency sign will email the emergency message along their geo-location to the ambulance. Etc.,

EXAMPLE FOR SENDING EMERGENCY MAIL:



Once the emergency sign is detected, the email is sent to the respective mail id using the help of smtp(simple mail transfer protocol) library.

CONCLUSION:

The Communicational Aiding System proposed here is used as a tool for conveying the messages for the mute people. This system is capable of bridging the communicational separation between the mute people

and normal people. This system captures the frames of the live streaming video and then the resultant word is found using the deep learning. The word recognised is converted to audio using the module gtts (Google Text to Speech) and read through the speaker. This system not alone make the mute people to communicate with the nearby normal people but also helps them to share their emergency situations. If any emergency help is required for the mute people, then they can use emergency signs so that the email with their respective location is sent to the respective persons. This could help them to get rescued from that emergency situations.

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