**REAL-TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED**

**Solution Requirements (Functional & Non-functional)**

**Functional Requirements**

**HAND IMAGE ACQUISITION:**

The hand gesture, during daily life, is a natural communication method mostly used only among people who have some difficulty in speaking or hearing. However, a human computer interaction system based on gestures has various application scenarios. In this module, we can input the hand images from real time camera. The inbuilt camera can be connected to the system. Gesture recognition has become a hot topic for decades. Nowadays two methods are used primarily to perform gesture recognition. One is based on professional, wearable electromagnetic devices, like special gloves. The other one utilizes computer vision. The former one is mainly used in the film industry. It performs well but is costly and unusable in some environment. The latter one involves image processing. However, the performance of gesture recognition directly based on the features extracted by image processing is relatively limited. Hand image captured from web camera. The purpose of Web camera is to capture the human generated hand gesture and store its image in memory. The package called python framework is used for storing image in memory

**BINARIZATION**

Background subtraction is one of the major tasks in the field of [computer vision](https://en.wikipedia.org/wiki/Machine_vision) and [image processing](https://en.wikipedia.org/wiki/Image_processing) whose aim is to detect changes in image sequences. Background subtraction is any technique which allows an image's foreground to be extracted for further processing (object recognition etc.). Many applications do not need to know everything about the evolution of movement in a video sequence, but only require the information of changes in the scene, because an image's regions of interest are objects (humans, cars, text etc.) in its foreground. After the stage of image preprocessing (which may include [image denoising](https://en.wikipedia.org/wiki/Image_denoising), post processing like morphology etc.) object localization is required which may make use of this technique. Detecting foreground to separate these changes taking place in the foreground of the background. It is a set of techniques that typically analyze the video sequences in [real time](https://en.wikipedia.org/wiki/Real_time_(media)) and are recorded with a stationary camera. All detection techniques are based on modeling the background of the image i.e. set the background and detect which changes occur. Defining the background can be very difficult when it contains shapes, shadows, and moving objects. In defining the background it is assumed that the stationary objects could vary in color and intensity over time. Scenarios where these techniques apply tend to be very diverse. There can be highly variable sequences, such as images with very different lighting, interiors, exteriors, quality, and noise. In addition to processing in real time, systems need to be able to adapt to these changes. The implement the techniques to extract the foreground from background image. Using Binarization approach to assign the values to background and foreground. Foreground pixels are identified in real time environments

**6.2.3 REGION OF FINGER DETECTION**

Segmentation refers to the process of partitioning a digital image into multiple segments. In other words, grouping of pixels into different groups is known as Segmentation. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics The division of an image into meaningful structures, image segmentation, is often an essential step in image analysis, object representation, visualization, and many other image processing tasks. But segmentation of a satellite image into differently textured regions (groups) is a difficult problem. One does not know a priori what types of textures exist in a satellite image, how many textures there are, and what regions have certain textures. The monitoring task can be performed by unsupervised segmentation and supervised segmentation techniques. A region of interest (ROI) is a subset of an image or a dataset identified for a particular purpose. In other words, region of interest (ROI) can be defined as a portion of an image which is needed to be filtered or to be performed some other operation on.

**CLASSIFICATION OF FINGER GESTURES**

Artificial Neural Networks (ANN) can learn and therefore can be trained to recognize patterns, find solutions, forecast future events and classify data. CNN is well documented to be used for traffic related tasks. Neural Networks learning and behavior is dependent on the way its individual computing elements are connected and by the strengths of these connections or weights. These weights can be adjusted automatically by training the network according to a specified learning rule until it performs the desired task correctly. CNN is a supervised learning method i.e. a machine learning algorithm that uses known dataset also known as training dataset. These known parameters help CNN to make predictions. Input data along with their response values are the fundamental components of a training dataset. In order to have higher predictive power and the ability to generalize for several new datasets, the best way is to use larger training datasets. The fingers can be classified by using convolutional neural network algorithm. CNN is a common method of training artificial neural networks so as to minimize the objective function. It is a supervised learning method, and is a generalization of the delta rule. It requires a dataset of the desired output for many inputs, making up the training set. It is most useful for feed-forward networks (networks that have no feedback, or simply, that have no connections that loop).

**SIGN RECOGNITION**

Sign Language is a well-structured code gesture, every gesture has meaning assigned to it. Sign Language is the only means of communication for deaf people. With the advancement of science and technology many techniques have been developed not only to minimize the problem of deaf people but also to implement it in different fields. From the classification of sign features, label the signs with improved accuracy rate.

**Non - Functional Requirements**

**Usability**

The system shall allow the users to access the system with pc using web application. The system uses a web application as an interface. The system is user friendly which makes the system easy

**Availability**

The system is available 100% for the user and is used 24 hrs a day and 365 days a year. The system shall be operational 24 hours a day and 7 days a week.

**Scalability**

Scalability is the measure of a system&#39;s ability to increase or decrease in performance and cost in response to changes in application and system processing demands.

**Security**

A security requirement is a statement of needed security functionality that ensures one of many different security properties of software is being satisfied.

**Performance**

The information is refreshed depending upon whether some updates have occurred or not in the application. The system shall respond to the member in not less than two seconds from the time of the request submittal. The system shall be allowed to take more time when doing large processing jobs. Responses to view information shall take no longer than 5 seconds to appear on the screen.

**Reliability**

The system has to be 100% reliable due to the importance of data and the damages that can be caused by incorrect or incomplete data. The system will run 7 days a week. 24 hours a day.