Dumb – Deaf Aid Telephone System

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Abstract— It is an easier way for non-vocal people to communicate with vocal people and express themselves to the hearing world. Dumb-Deaf aid mobile communication system with voice transmission is complex electronic devices that can help to provide power of speak to a dumb and deaf person. With this device a normal man can easily communicate with a disabled person with a hand held device. This system is a process of recognizing hand gestures captured using video camera and a standard consumer personal computer. A pattern recognition system will be using a transform that converts an image in to a feature vector, which will then be compared with feature vectors of a training set of gestures. The gesture voice is transmitted via GSM. The receiver side person can hear voice of dumb person through this system. The voice from the normal person is then transmitted and the voice to text conversion is held after receiving the voice signal by the proposed system. This system also provides normal person make call to communicate to dumb and deaf person. Hence two way communication is possible.

Key words: GSM, ANN

I. INTRODUCTION

The serious issue for the deaf and dumb community is obviously the difficulty in communicating with vocal people. These people communicate via sign language; however, the main issue is that the majority of people are not familiar with sign language and they are not willing to learn this language. This generated an idea to propose this project in which it will drastically facilitate and improve a communication method between the non-vocal and vocal people. Many researches have been conducted in the last ten years to develop sign to speech/text translators.

Here in our project we are going to take up this issue to build a mobile communication system which can interpret the sign language by dumb and deaf people into speech output. It has the capability of capturing human hand signals and produce speech (voice) output accordingly. Sign language is an expressive and natural way for communication between normal and disabled people (information's majorly conveys through the hand gesture).The intension of the sign language translation system is to translate normal sign language into speech and to make easy communication with the dumb people. In order to improve the life style of the disabled people the proposed system is developed.

Sign language uses both physical and non-physical communication. The physical gesture communication consists of hand gesture that convey respective meaning, the non-physical is head movements ,facial appearance body language and this is different from country to country in orientation and position. Sign language is not universal.

The image processing techniques uses a camera to capture the image/video and analyses the data with static images and recognize the image using algorithms and produce voice signals as output. Vision based sign language recognition system mainly follows the algorithms are hidden Markov mode, Artificial neural Networks(ANN) and Sum of Absolute Difference(SAD) Algorithm use to extract image and eliminate the unwanted background noise. Current techniques using super gloves for hand gesture image capturing have disadvantages. It requires a specially designed glove which is an additional hardware. Moreover, there is a delay between input and output too. In order to overcome such drawbacks a device based on neural network is build. This will have the features of efficient generalization ability, tolerance to input noise by hand colour detection, reduced delay, parallel processing, and mathematical modelling is not required.

For a normal person who uses sentences, signs may form complications. Sentences are at a rate, which is about the same as for a Speech. So a system which can provide the power of speech to dumb person will be more helpful for them to convey their ideas to the world.

II. LITERATURE SURVEY

Most of these are based on computer vision techniques for sign recognition [1]- [4]. The efficiency of these techniques depends on the video quality, which is significantly impacted by the ambient light and situation of the implemented camera (resolution, focusing, alignment and mechanical-vibration). Such effects may result in noisy pictures that reduce the system capability to identify the sign and recognize the corresponding meaning. Generally, the applicability of these systems is limited in dark areas and the user mobility (the user should be properly alignment with the camera).

Another system described in [5] presents handgloves based sign to speech/text system. All of these systems are computer based, which accordingly increases the cost, size and power, and reduces the mobility of these systems. Also, all of these systems are designed for English language. In this paper, a sign to Arabic language speech/text system is developed. According to the best knowledge of the authors, there is no commercial product for Arabic language and this paper is one of the initiative researches in this area. The main advantages of the developed system, with respect to others, are its simplicity, low cost, low power and its full mobility. Also, it is a hand-glove based and thus it can be used even in dark environment, and there is no restriction on the user movement. Furthermore, only one hand is used to represent all signs, which makes it easier and more comfortable. In this system, the sign recognition is performed by flex sensors based glove interfaced to microcontroller

wirelessly. The microcontroller implements an in-house developed program to recognize the sign and implement the corresponding Arabic alphabet vocally and textually.

This is easier than sign to word translator, which needs complicated system with a lot of hand, facial and body gestures to convey the meaning [6]. Thus, an advantage for the proposed system emphasizes on its capability to translate sign to letter, which has low cost and it can be used to represent wider range of words. Further, the system is simpler and needs fewer sensors, and this adds extra reduction for the cost.

III. BLOCK DIAGRAM AND CIRCUIT DIAGRAM OF THE SYSTEM

Microcontroller, MAX 232, Keypad, GSM are the hardware parts.

In which Microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals etc. However, compare to others microcontroller is fast and very ease to program in C language because of huge support can gain from the manufacturer for programming. Here microcontroller At Mega32 is used.

LCD is a flat panel display, electronic visual display that uses the light modulating properties of liquid crystals. A liquid crystal display consists of an array of tiny segments (called pixels) that can be manipulated to present information.

The MAX232 is an IC that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels.

A keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices such as calculators, push-button telephones, combination locks, and digital door locks, which require mainly numeric input. The keypad we are using is 4*4 matrix keypad in which 16 number of push button switches are there. It is used in this particular project for dialing the number.

GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. A GSM modem can be a dedicated modem device with a serial, USB or it can be a mobile phone that provides GSM modem capabilities.

Camera, Image acquisition, Image recognition and feature extraction is done by system with help of corresponding software. Camera, an optical instrument that records images that can be stored directly, transmitted to another location, or both. These images may be still photographs or moving images such as videos or movies.

Image acquisition in image processing can be broadly defined as the action of retrieving an image from some source, usually a hardware-based source, so it can be passed through whatever processes need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed and is the result of whatever hardware was used to generate it, which can be very important in some fields to have a consistent baseline from which to work. One of the ultimate goals of this process is to have a source of input that operates within such controlled and measured guidelines that the same image can, if necessary, be nearly perfectly reproduced under the same conditions so anomalous factors are easier to locate and eliminate.
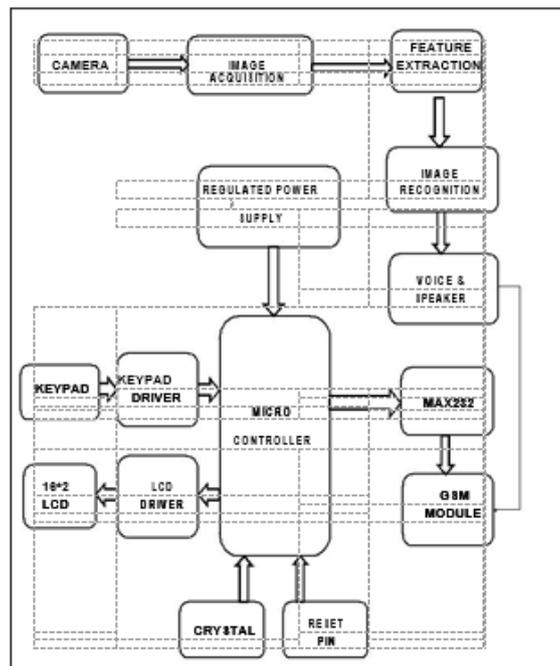

Fig. 1: Block Diagram

Image recognition is the process of identifying and detecting an object or a feature in a digital image or video. This concept is used in many applications like systems for factory automation, toll booth monitoring, and security surveillance. Typical image recognition algorithms include: Optical character recognition, Pattern and gradient matching, Face recognition, License plate matching, Scene change detection.

In pattern recognition and in image processing, feature extraction is a special form of reduction. When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant then the input data will be transformed into a reduced representation set of features (also named features vector). Transforming the input data into the set of features is called feature extraction. If the features extracted are carefully chosen it is expected that the features set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input.
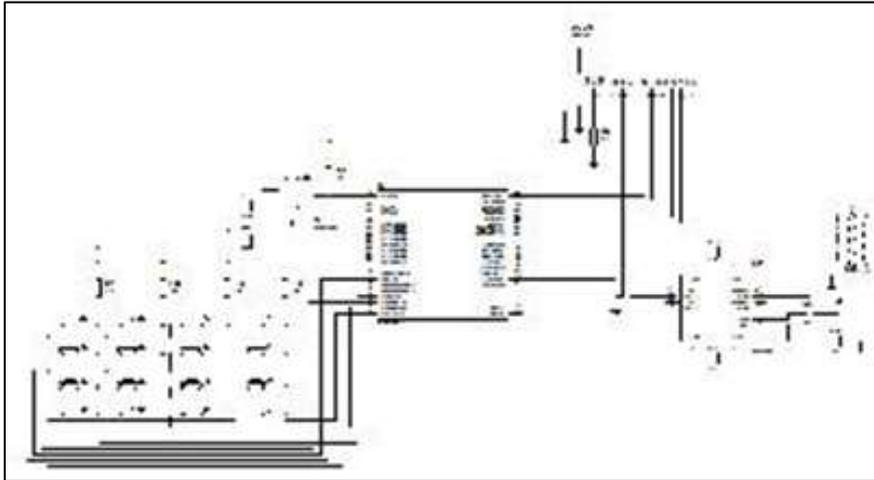

Fig. 2: Circuit Diagram
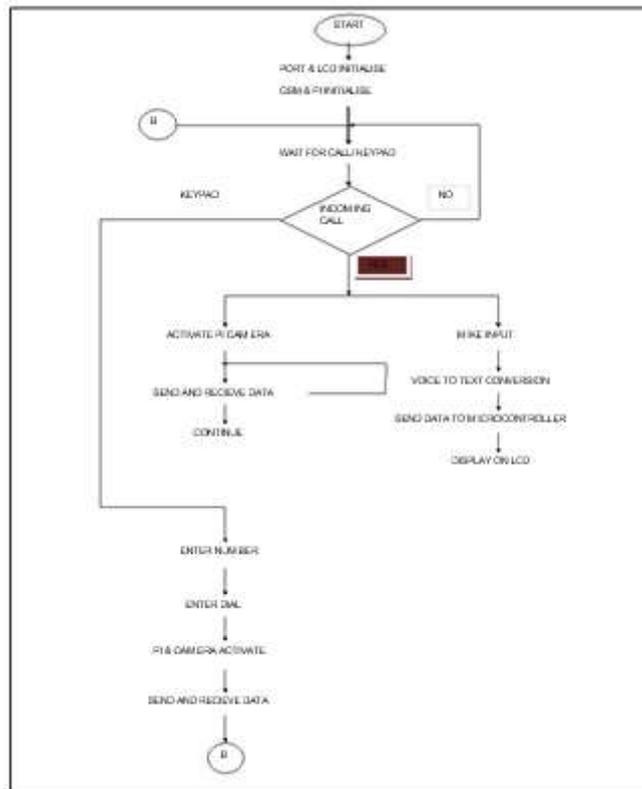
IV. FLOW CHART AND ALGORITHM OF THE SYSTEM

Fig .3: Flow chart

- STEP 1: Start
- STEP 2: Initializing GSM, LCD and Microcontroller Ports.
- STEP 3: Wait for incoming/outgoing call.
  For outgoing call, go to Step 4 then to Step 6.

For incoming call, go to Step 5.
STEP 4: a. Enter the number in keypad. b. Dialing the number.
STEP 5: a. For accept the call, dial 1 then go to Step 6.

a) For call decline, dial 4 then go to Step 3. STEP 6: a. Activate camera.
b) Send the data after image recognition.
c) Receive the mike input.
d) Voice to text conversion
e) Send the data to microcontroller
f) display on LCD
g) Continue till call ends

- STEP 7: END

V. HAND GESTURE RECOGNITION USING NEURAL NETWORK

Hand gesture recognition is not limited to a paper or digital surfaces. It is also extended to the third dimension. Several researches and attentions are given to this topic because of the difficulties in computational capabilities, learning algorithms and camera performance. Rapid improvements are achieved over the past few years. Complications are made from the static gesture detection. Gesture detection is the combination of different figure states, angles of fingers and its orientations.

A. Neural network

Here gestures are recognized by using neural network .This is an information processing paradigm, inspired by the biological nervous system. For example, it works like how a human brain processes the information. The key element is the novel structure of the information processing system. It solves a specific problem by working large number of highly interconnected processing element together. Like people, it learn from examples. The remarkable advantage is that it can detect gestures effectively than humans or by other computer techniques even if it is complex trained neural network can be called as an "expert" in the category of information it has been given to analyze. It solves the problem by itself and this cause the problem of unpredictability which is one of the disadvantages.

B. Hand colour detection

One of the major problems in hand gesture recognition is the background noise. If the dumb person is in a public place such as airport, railway station etc. the background noise will also get converted to voice output. This will create difficulties in the communication. To avoid this, skin colour detection can be used. The skin colour of the dumb person can be extracted from the image taken by camera. By doing this accurate result can be produced. Another approach involves finding the boundary contours of the hand and it is robust in scale, translation and rotation, yet it is extremely demanding computationally. In a multi-system camera is used to pick the centre of gravity of the hand and points with maximal distances from the centre provide the locations of the finger tips, which are then used to obtain a skeleton image, and finally for gesture recognition for particle filters

C. Design Implementation

1) Phase I: Image capturing

When the user gives the command by using his hand, the gestures are captured by a video camera. Phase II : Image processing A pattern recognition system will be using a transform that converts an image into a feature vector, which will then be compared with the feature vectors of a training set of gestures.

2) Phase III: The Gesture Recognition

Gestures are recognized by using neural network. Artificial neural network are generally presented as system of interconnected neurons which can compute values from inputs and are capable of pattern recognition.

3) Phase IV: Voice Transmission

The gesture voice is transmitted via DTMF coder/or an application MODEM or GSM. A default number will be configured; in addition with manual dialling using a graphical user interface designed. The receiver side person can hear voice of dumb person through this system. The transmitted voice from normal person is converted to text at the receiver section and is displayed on the LCD.

4) Phase V: Implementation

The system shall implement in Raspberry Pi using open CV language.
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VI. FUTURE SCOPE

- Dumb-Deaf aid telephone system with video conferencing facility Use of same device by multiple people.
- The recognition of moving gestures can be resolved using accelerometer sensor at wrist for full capture of the wrist movement changes

VII. CONCLUSION

The dumb and deaf aid mobile communication system with hand gesture recognition using neural network has been implemented. The main consideration of this project is to develop a mobile communication aid for dumb and deaf persons using

emerging embedded system. The device is more portable and the application is easier to use and have more functions, than the paper media. This system is Faster and provides more effective communication between the dumb & deaf and normal person. The problems in the image comparison are also solved.

REFERENCES

[1] Starner, T. and Pentland, A., "Visual recognition of American Sign Language using hidden Markov models," in Proceedings of the International Workshop on Automatic Face and Gesture Recognition, 1995.

[2] Starner, T., Weaver, J., and Pentland, A., "Real-time American Sign Language recognition using desk and wearable computer based video," IEEE Transactions onPattern Analysis and Machine Intelligence, vol. 20, no. 12, pp. 1371-1375, 1998.

[3] Bauer, B., Hienz, H., and Kraiss, K., "Video-based continuous sign language recognition using statistical methods," in ICPR 2000, pp. 463- 466, Vol II.

[4] Bauer, B., Hienz, H., and Kraiss, K., "Video-based continuous sign language recognition using statistical methods," in ICPR 2000, pp. 463- 466, Vol II.

[5] Brashear, H., Park, K.-H., Lee, S., Henderson, V., Hamilton, H., and Starner, T., "American Sign Language recognition in game development for deafchildren," in ASSETS 06, (New York, NY, USA), pp. 79-86, 2006.

[6] Olga Katzenelson and Solange Karsenty, "A Sign-to Speech Glove," in the Proceedings of the 3nd IUI Workshop on Interacting with Smart Objects, Haifa,Israel, February 2014, pp.19-23.