

Sign to Speech and Display Converter

K. ANUDEEP¹, P. NAGESWARA GOUD², K. SRI HARSHA³, K. NARAYANA SWAMY⁴

^{1,2,3,4} UG Students, Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, Andhra Pradesh, India

Abstract -- This report presents a system VISION-BASED SIGN LANGUAGE TRANSLATION DEVICE for automatic translation of gestures into speech in English to assist the impaired people to communicate with hearing people. It can be used as a translator for people who do not understand sign language. The proposed system is an interactive application program developed by using MATLAB software and incorporated into Arduino board. The sign language gesture images are acquired using the inbuilt camera of the LAPTOP or Webcam; vision analysis functions are performed in the operating system and provide speech output through speaker which is in connection with APR33A3 the inbuilt audio device thereby minimizing hardware requirements and expense. The information is sent one after another through the Arduino in 8 bit format to reduce the error. This allows for almost instantaneous recognition from finger and hand movements to translation. This is able to recognize one handed sign representations of alphabets (A-Z) and numbers (0-9). The results are found to be highly consistent, reproducible, with fairly high precision and accuracy.

Indexed Terms: sign language, MATLAB, GUI.

I. INTRODUCTION

In general deaf, dumb and blind people face difficulties in communication with others. Sign language is the most common way of communication; it is a movement of one or both hands, followed with facial expression that refers a specific meaning. The main aim of this project is to develop a new vision based technology to recognize and translate the continuous sign language to text.

EXISTING METHOD

The language which uses the hand gestures, facial expressions and body movements for communication referred to sign language. Sign

language is the only communication meant for deaf and dumb people, which consists of either word level signs or finger spelling. But as the hearing people never show an interest in learning the sign language, the deaf people face a difficulty to interact with normal people without a sign language interpreter. This creates the isolation of deaf people in the society. So the implementation of the system that automatically recognizes the sign language is necessary to provide a better platform for the interaction of the deaf, dumb and blind people with the rest of the world without an interpreter.

PROPOSED METHOD

To overcome this difficulty we came up with a solution called “VISION BASED SIGN LANGUAGE TRANSLATOR”. A colored tape is fitted to the finger which acts as an input. We have to show this finger to pc with installed MATLAB. The output from pc is digital and processed by using microcontroller and then it responds as voice by using speaker which can be used for both blind and dumb people. On the other hand we use LC display for the message which can be useful for deaf. Here, we provide four buttons for blind with predefined voices and the last button for emergency call. GSM module supports for receiving the call.

In this project the hardware components we have used are 8 bit Microcontroller (ATMEGA 2560), LCD display, Bluetooth module, GSM module, power supply and voice IC (APR33A3). Software used is Keil U Vision, Embedded MATLAB.

II. ABOUT MATLAB

MATLAB is a Multi paradigm numerical computing environment. It is a proprietary programming language developed by Math Works. Matlab allows Matrix Manipulations. It integrated

computation, visualization and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. The MATLAB working environment provides a set of tools and facilities to work with, it includes facilities for managing variables in the workspace, importing and exporting data. It also includes tools for developing, managing and debugging. Matlab also supports various languages like C, Cpp, Java, FORTRAN, Python, etc. Matlab code compiler helps to convert the Matlab code to any other language.

MATLAB Graphics system includes high-level commands for two dimensional and three-dimensional data visualization, image processing and animation and presentation graphics. It also includes low-level commands that allow to fulfill customize the appearance of graphics as well as to build complete Graphical User Interface on Applications.

MATLAB IMAGE PROCESSING TOOL BOX

Image processing toolbox provides a comprehensive set of reference-standard algorithms and workflow apps for image processing, analysis, visualization and algorithm development. We can perform image segmentation, image acquisition, noise reduction, geometric transformations and 3D image processing.

Image processing tool box let us automate common image processing workflows. We can interactively compare image registration techniques and batch process large datasets. Visualization functions and apps allow exploring images, 3D volumes and videos, adjusting contrast, creating histograms and manipulating the regions of our interest.

III. WORKING EXPLANATION

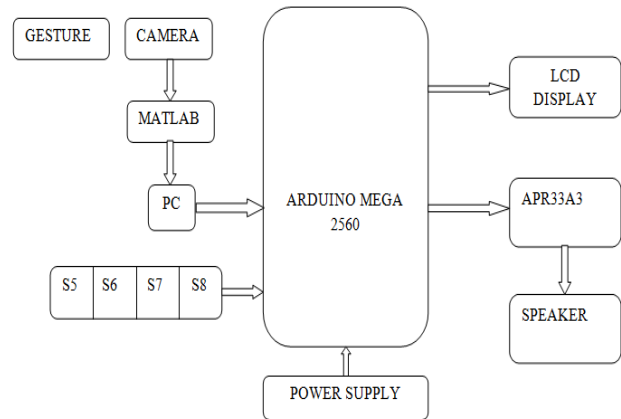
Mainly we have Arduino, Speakers, LCD display, System (PC) and RS232 cable to connect system with arduino and APR33a3. In personal computer we make use of Matlab software for digital image processing i.e., in order to identify gestures which are made by fingers. From Math works we referred digital image programming. After dumping program for digital image processing dump commands

for arduino board which translated the program i.e., which can be understandable by APR33A3.

RS232 cable is used to connect system with arduino board. We use switches as inputs i.e., in case of emergencies which are placed separately. Arduino we used is ATMEGA2560 in which there exists 52 Dc pins, we use only 8 pins i.e., 4 pins as inputs and 4 as outputs.

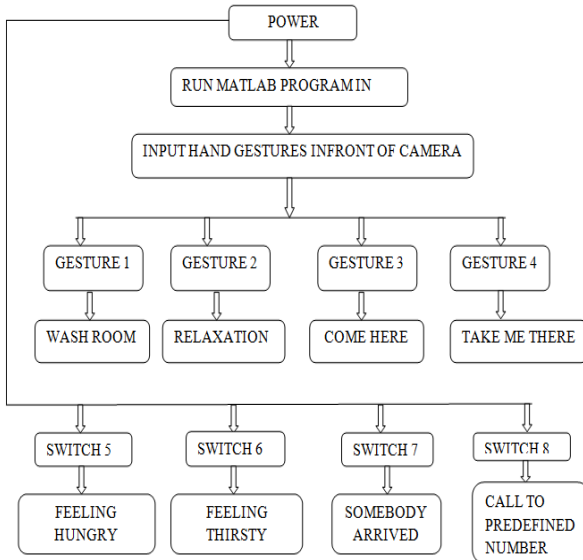
Output is taken at LCD displays or Speakers, which is connected to APR33A3 module. Initially we build with voices in record mode which is necessary to speaker output. LCD display works on inbuilt programming. This is working of VBSL kit.

IV. WORK FLOW DIAGRAM



We make gestures with fingers in front of the camera which is connected to PC. Camera (can be used with any resolution based on the requirement) identifies the gestures and then MATLAB starts running its process in the system. Connect Arduino board to PC as well as switches to the Arduino board itself. Arduino works as a language translator. And LCD display and Speaker is connected at the output side, where as speaker is connected through APR33A3 voice module in which voice modules are recorded initially.

V. OVERVIEW OF PROCEDURE

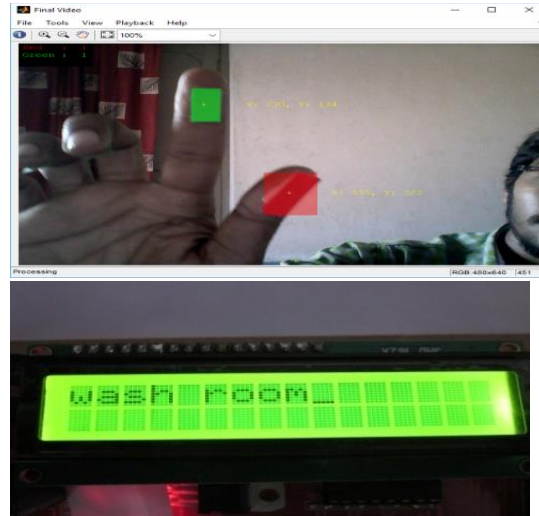


At the starting of program a command ‘delete’ will be given, which helps to delete the data that was previously stored in the device. And baud rate is to be fixed in order to move the data abruptly to arduino from RS232 cable and also defined threshold values of colors are considered to detect so that any other color can’t be taken into consideration; here we’ve taken baud rate of 9600. Video device is used to acquire the input video in form frames of 640x480 size. The centroid of the image and dimensions are analyzed with minimum and maximum areas. The commands `hshapeinbox`, `htextinsred` and `htextinsgreen` are used to give the shape of the color, information about red and green color with dimensions respectively.

The video runs up to 1000 frames; the command ‘step’ is used for the replacement of snapshot command i.e., every single frame is counted and derived and; ‘flipdim’ to invert an image. The command ‘`imsubtract`’ is used to subtract the required color from various colors of an acquired input image. After the subtraction of the required colors from RGB format the image has to be filtered in order to get smooth image which is from noise. The filtered image is then converted into binary format (black and white image) in which information area is represented by 1’s and remaining dark area by 0’s.

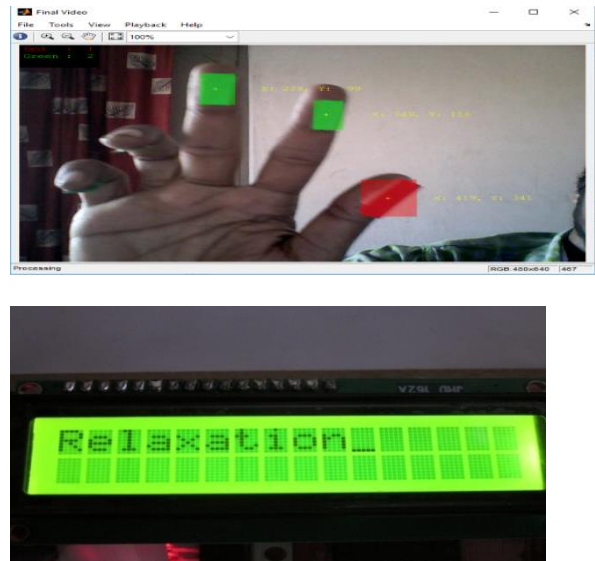
When the user shows the hand gesture (finger wounded with a colored tape) in front of the camera, the recognition is performed by using MATLAB color detection program based on the color intensity. Based on the number of fingers shown, the gesture is recognized by the camera and gives the sign language of corresponding gesture. We have used four switches besides gestures as additional inputs.

RESULT 1:



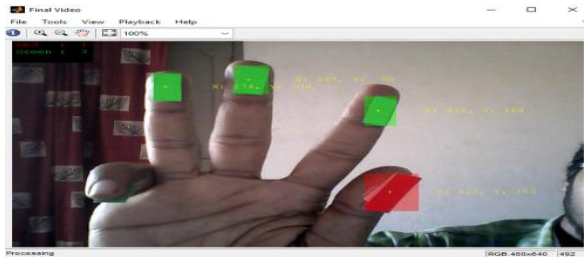
These are the images of the output when the hand gesture 1 (one figure) is recognized by the camera.

RESULT 2:



These are the images of the output when the gesture 2 (two fingers) is recognized by the camera.

RESULT 3:



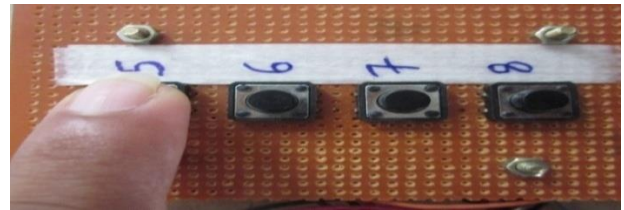
These are the images of the output when the gesture 3 (3 fingers) is recognized by the camera.

RESULT 4:



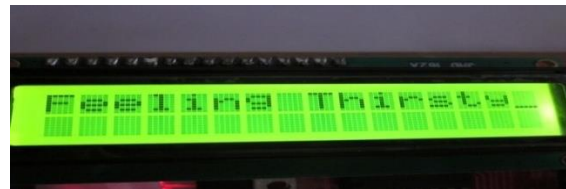
These are the images of the output when the gesture 4 (four fingers) is recognized by the camera.

RESULT 5:



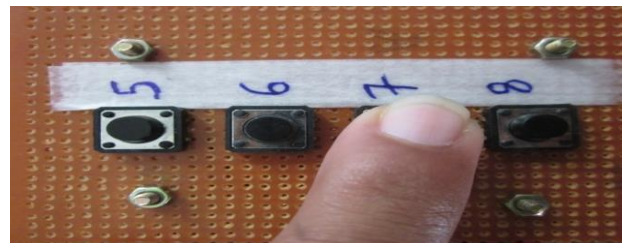
Images of the output when switch S5 is pressed.

RESULT 6:



Images of the output when switch S6 is pressed.

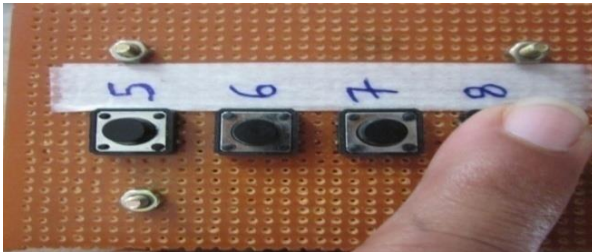
RESULT 7:





Images of the output when switch S7 is pressed.

RESULT 8:



Images of the output when switch S8 is pressed.

VI. CONCLUSION

In this work, a vision based sign language recognition system using MATLAB software for automatic sign language translation has been presented. This approach uses the feature vectors containing all the aspects of the sign. The orientation and the configuration or shape of the hand of the signer conveys a large portion of the information of the signs. Therefore the features which are extracted from the hand of the user improve the accuracy of the system to a great degree.

FUTURE SCOPE

To increase the accuracy and performance of the automatic recognition of sign language translator, the quality of database used should be enhanced with significant characteristics in each individual sign and

further improves the performance. We can use the combinations of two or more fingers for more efficiency.

REFERENCES

- [1] Paschaloudi N. Vassilia, Margaritis G. Konstantinos "listening to deaf": A Greek sign language translator', 0-7803-9521-2/06/\$20.00 ©2006IEEE.
- [2] Beifang Yi Dr. Fredrick C. Harris 'A Framework for a Sign Language Interfacing System', A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Computer Science and Engineering May 2006 University of Nevada, Reno.
- [3] Helene Brashear & Thad Starner 'Using Multiple Sensors for Mobile Sign Language Recognition', ETH- Swiss Federal Institute of Technology Wearable Computing Laboratory 8092 Zurich, Switzerland flukowicz, Junker g@ife.eeethz.ch
- [4] K. Abe, H. Saito, S. Ozawa: Virtual 3D Interface System via Hand Motion recognition From Two Cameras. IEEE Trans. Systems, Man, and Cybernetics, Vol. 32, No. 4, pp. 536-540, July 2002.