Introduction:

The fast paced growth of technology in this era has made the living style of human beings very luxurious and also made tasks much more fast and efficient .One place where this innovation leaves an abyss is in the development for the ones with special needs.

Statistics shows that the world has 39 million blind people and india-15 million Thus it seems that India cover a very large population among the visually impaired(all categories).It has been studied that 90% of the blind population of the world belong to developing countries.

So that's the thought where inspiration ignites for devising a device with wide variety of features for the Blind, giving them much more easy way to communicate with the world by exploiting their God given gift of touch and sound sense.

Abstract: Technology has developed to such an extent that it is possible to emulate artificial eyes for the blind and deaf-blind, using two cameras equipped with image processing, computer vision running on microprocessors and microcontrollers which give output in form of sound and touch.

Keywords: Braille, Image processing, Computer Vision, Stereo vision, UART, ATmega16, raspberry pi,Tesseract,Espeak,Atmega 16.

Design:

The initial model developed was using suspension and straps to hold the stand of two cameras. The processor used i.e. a laptop and atmega16 the microcontroller were carried inside the bag worn behind. Vibrators and tied at six selected spots using straps. A wired braille keyboard for braille language input and the manual control of software developed for the project. The design with much more flexibility is discussed in the future scope of the project.

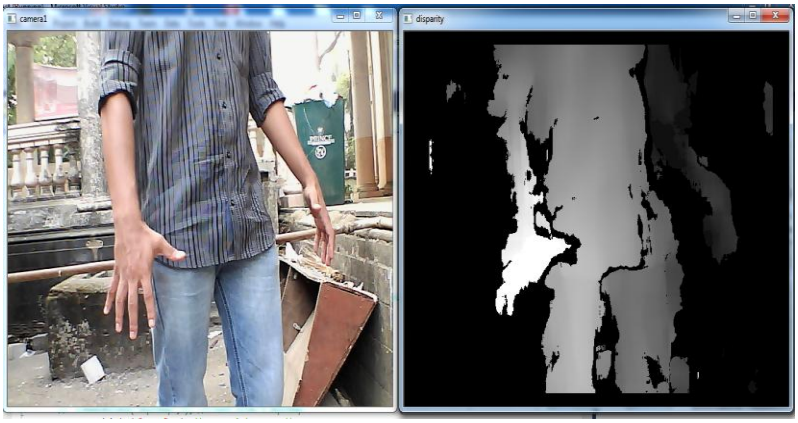
Hardware platform:
Raspberry pi:

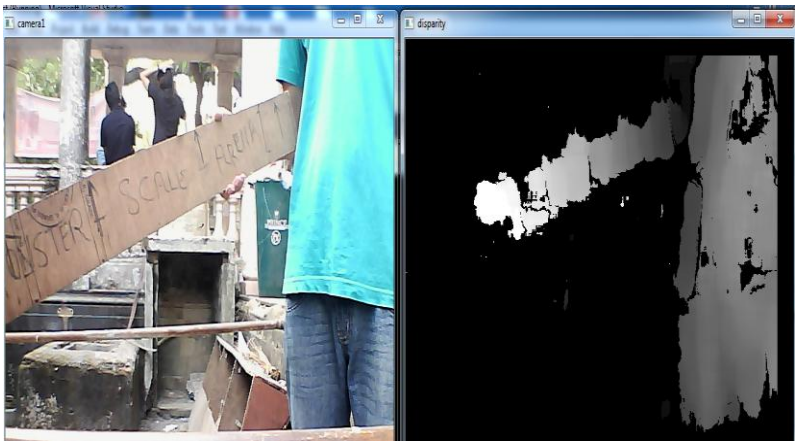
Atmega 16:

Software platform:

Modules:
Braille keyboard: (put the pic of pad here)

Obstacle detection:
This module is the heart of the project that uses both the cameras simultaneously. The images taken simultaneously I fed to the disparity algorithm of stereovision giving output image in terms of distances obstacles from the cameras. The cameras are placed at a distance from each other just like the pair of eyes a human being has. The disparity is converter into a binary image that is divided into six blocks corresponding to six vibrators attached to the body. The pattern by which the vibrator vibrates gives the blind and blind deaf an approximation of the shape of object in front of them.
An output generated during of our trials.

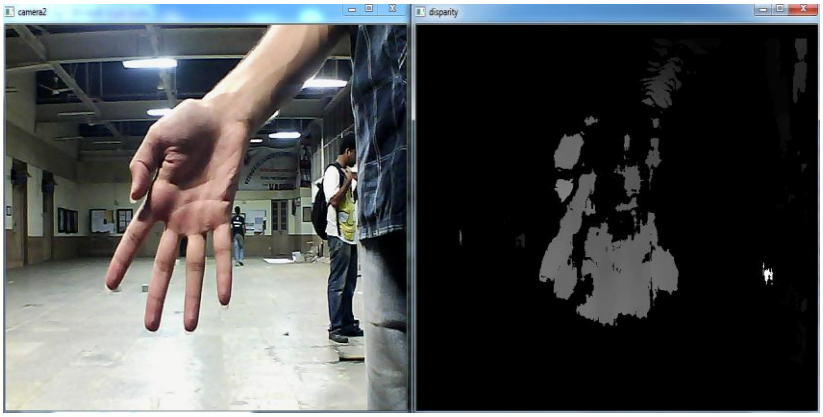




Trial with rectification:

Problems with disparity working in broad daylight and night time.
Solution: Histogram equalization and intensity modulation for stereo requirement.

One of the trials during night:

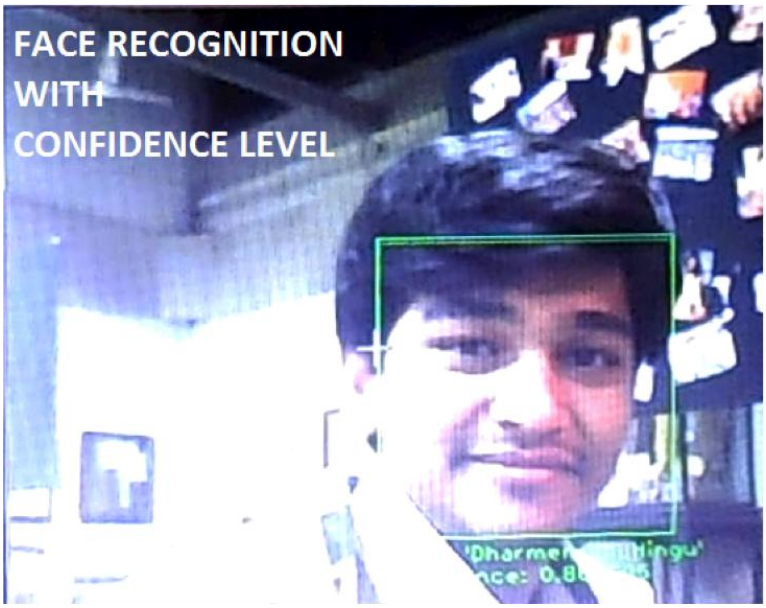


One of the trials with the algorithm:

Face Recognition:A blind individual uses the touch or the sound of a person to recognize him or her. This difficulty can be solved using the face recognition algorithm linked with espeakspeech synthesizer to read out a person's nameperson's identity when he or she is in front of the blind person. New people can be added to the database and trained just using the keys provided in the braille keyboard. The algorithm used was eigen faces*need to giv link to main eigen paper*.

Eigen faces flow chart:

One of the outputs of face recognition software:

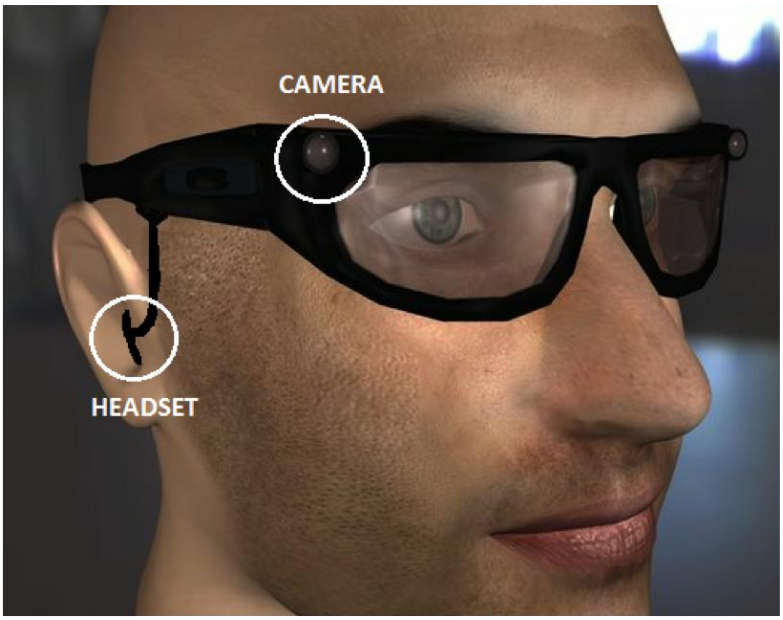


Text readout (OCR – Optical Character Recognition):
The blind are comfortable reading books printed in braille. But there will always be a difficulty in taking up the initiative in printing all books, newspapers, pamphletsets in braille. One universal reader tesseract which is linked to espeak. Procedure:

Color Recognition: This module is something that reads out the colour of object in the centre in the camera's image. The image taken from one of the cameras is masked to a binary image with just ones in a rectangular pattern. The average colour of all ixels in that rectangle is taken and nearest colour name to that value is read out.

Virtual Object Tagging: The objects around like pickle bottles, books etc can be saved into the database and this algorithm reads out what object it is for the blind individual. This is somewhat analogous to face-recognition but helps in another stream of objects and not faces of people.

Current development and future scope:



References:

1)http://articles.timesofindia.indiatimes.com/2007-10-11/india/27977420_1_avoidable-blindness-ophthalmologists-eye-diseases
2)http://www.who.int/mediacentre/factsheets/fs282/en/

3)face rec info link:
http://www.cognotics.com/opencv/servo_2007_series/index.html

face rec info link:
http://opencv.willowgarage.com/wiki/FaceRecognition

face rec tutorial link:
http://www.cognotics.com/opencv/servo_2007_series/part_4/index.html

face rec this is where i got the code :
http://www.shervinemami.info/faceRecognition.html

face rec Face rec on raspberry pi:
http://thinkrpi.wordpress.com/magic-mirror/

face rec training data:
ftp://mozart.dis.ulpgc.es/pub/Software/HaarClassifiers/FaceFeaturesDetectors.zip

4)stereo vision part links
http://www.eletel.p.lodz.pl/programy/naviton2/index.php?option=com_content&view=article&id=76&catid=42&Itemid=211

Technical words I came across ---- speech feedback, audio system

Stereo referecnces
http://infoscience.epfl.ch/record/99014/files/haptex05.pdf