IJFEAT
INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

SMART SPECTS FOR VISUALLY IMPAIRED PEOPLE

Miss. Sapana D. Chaudhari[1], Miss. Sanjana R. Yamawar[2], Prof. Dhiraj D. Shirbhate[3]
[1] *Student, C.S.E Dept,J.D.I.E.T.Yavatmal,Maharashtra,India,sapanachaudhari724@gmail.com*
[2] *Student, C.S.E Dept,J.D.I.E.T.Yavatmal,Maharashtra,India,sanjanayamawar73@gmail.com*
[3] *Asst.Prof. C.S.E Dept,J.D.I.E.T.Yavatmal,Maharashtra,India,shirbhate.dhiraj@gmail.com*

Abstract

In this paper, we are going to present a new concept of smart glass system for people who are blind or have low vision or those who cannot see properly. There are many Individuals with visual disability for them it is difficult to communicate effectively with the environment in day to day activities. Most of the blind individual or visually impaired rely largely on their other senses such as hearing, touch, and smell in order to understand their surroundings and to deal with the problems arising on daily basis. It is sometimes very hard for them to go out alone, finding toilets, subway stations, restaurants and so on in which they may find it difficult to deal with. The main objective of the smart glass is to give vision of accessibility to their environment, in which they can survive on their own. The smart glass system that has been introduced can give the blind people vision to see the world, and they may get voice instructions and hints through wireless headphone. This smart glass system will help visually impaired people gain independence and freedom in the modern city life where individuals don't have much time for such impaired people. Therefore, we have designed and implemented such an application of public sign recognition in the smart glass system that will be very helpful for such individuals. This application can detect and recognize the public signs in cities, and give voice instructions or hints to the blind people. The proposed standard system is based on Intel Edison, and the application in the system is written in C++ with libraries of Open CV. Extended testimony of the system will be presented to show how the system helps the blind people "see the world".

Index Terms: *Smart glass system, Intel Edison, blindness, public signs recognition.*

---------- *** ----------

1. Introduction

On the basis of "World Health Organization" (WHO) report of 2012 there was 280 million people are visually impaired all over the world, which of these 241 million people had low vision and 39 million people were blind. The WHO published six regions which address estimated number of visually impaired people, the region namely African region, region of American eastern Mediterranean region, European region, South east region, Western pacific region. In the fast moving and rapidly growing world, the visually impaired people are left behind the world just because they could not cope up with the world. So just to make them adaptable to the surrounding, we made smart spect system which help those people who are suffering from blindness or low vision. Visually impaired people mostly depend on their hearing, smell and touch senses. The "Smart Spect System" observes the surrounding and provides voice hints to the person wearing it.

As there are various public signs which already being exist in our environment such as bus station, railway, aeroplane, hospital, hotel, school and so on are made for the normal people of any region. These all the public signs made for particular purpose. As we aware that all the public sign provide source of any purpose information for only normal people. Thus, these public signs cannot help to visually impaired people. So we made smart spect system for visually impaired people.

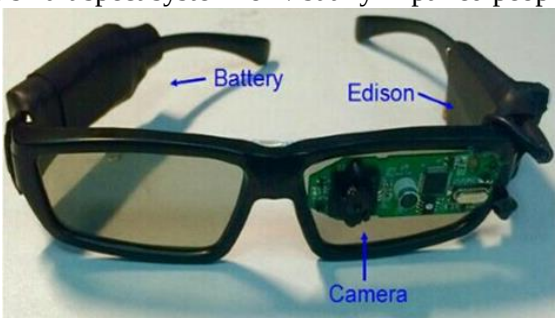

Fig.1 Smart Glass

This system will read same public sign and give the guideline to the impaired people with the help of wireless headphone. Hence public signs which exist in our environment are not only understandable by the normal people as well as impaired people. The advanced smart spect system is based on small Intel Edison chip. The Intel Edison is small computer provided by Intel as a development system for portable devices. The dimensions of Edison chip are 35.5×25×3.9 mm, with components on both sides. The Edison main SoC is a 22 nm Intel Atom "Tangier" that contain two Atom silvermont cores running at 500 MHz and one Intel Quark core at 100 MHz. The chip of Edison has 1 GB RAM combine on package. There are also connected 4

GB eMMC flash on Edison chip, Wi-Fi, Bluetooth and USB controllers. Edison is mighty in calculating but small in size which is suitable to construct a smart spect.

2.System Design

The smart spect system design consists of two parts: hardware design and software design. The block diagram of system shows in fig. 2. Detection of surrounding and public signs the camera will captured the surrounding and will send the video stream to the Intel Edison chip. Edison will collect video stream through UVC module, and transfers it to Yocto kernel which will call an Opencv functions to analyze and process the image. If the image will be matched, the Yocto kernel give the corresponding instruction according to match sign system will call the Bluez module to convert the instruction to the voice. The Alsa audio module transfers the audio signal to the wireless headphone by Bluetooth.

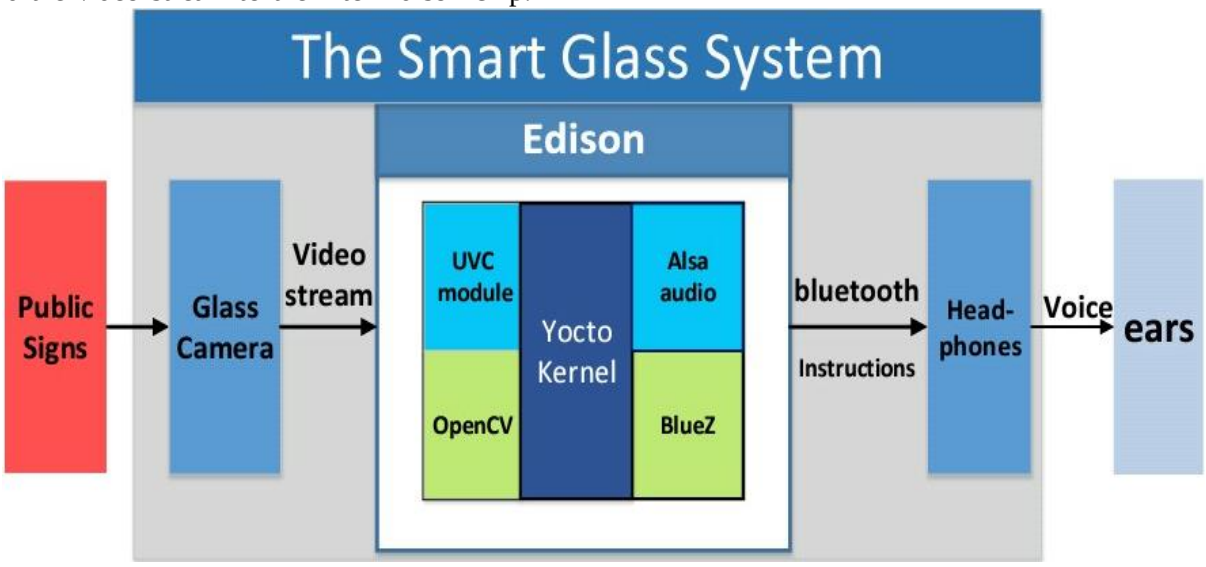

Fig.2 Block Diagram Of The System Design

A. Hardware Design

We have built the smart glass system using Intel Edison breakout board as Central Processing Unit in the hardware system on one side of the smart glass. Edison combines a cheap, powerful, small versatile hardware platform and partner enabled ecosystem with extended software consistency and supportive online environment. Edison has unified Wi-Fi, Bluetooth Low-Energy* (LE), memory, and storage simplifies configuration and increases scalability. Edison chip is very small and convenient to build wearable devices. Its high paramount performance and dual core CPU make it robust in computing and processing data, so we use this chip to make complex image processing. Fig.1 shows the paradigm of the smart glass. And also, we have a high digital camera in front of the smart glass. The smart glass is powered by the 9.6 voltage lithium battery; the battery is situated in the opposite side of the smart glass. The smart glass device is just like a normal sunglass that many of us may use in our daily routine. It is lightweight, easy to use for the blind people and to maintain. And The Edison chip used in this device runs the Linux based system which is being provided by the Yocto project. We set up Opencv 2.4.9 on Edison. The video stream will be catched by the camera in front of the glass. After that the video stream will be transferred to Intel Edison, and will be processed into the Yocto system. When finding the public signs, the people wearing the smart glass gives hints with a voice through the Bluetooth bone conduction headphones which can be heard by the individual.

B. Software Design

The program which is made for this system is written in C++ language and integrated development environment (IDE) of Eclipse was used to cross compile programs for Yocto Embedded System. The Opencv which contain 500 optimized algorithms for picture and video study is applied for the system. In Intel Edison, we applied this algorithm to getting the real time public sign matching. In the phase of sign detection and recognition, we observed that the public sign is widely calibrated by unnatural color and shape. Thus, they are easily noticeable by people. On other hand there will be also color based and shaped based method is use in same aspect but these methods are very delicate to the environment. Hence we applied recognition algorithm based on feature extraction and description. There are two algorithm “Scale Invariant Feature Transform (SIFT)” and “Speeded Up Robust Feature Transform (SURF)” are the most popular algorithms in image recognition research field. The SIFT is an algorithm is computer illusion to locate and described local feature in image and in computer illusion. SURF is a talented local feature locater and descriptor.

SIFT locates interest points in different scale by image pyramid and compute a set of orientation histograms

around one key point. Because SIFT is capable to compare a two images and it is able to control comparing problems like translation, rotation, affine transformation between two pictures. As SIFT has good performance but it take a lot of time to creating image pyramid. As compare to SIFT, SURF uses integral images, in order to Speed Up the computation time. The SURF is excellent feature-based algorithm and has been frequently used computer illusion application. In some cases, there is intricacy to picture, in such cases SURF algorithm is easily get by depending on integral images by creating on the strengths of the leading existing detectors and descriptors. Hence this combination leads to novel detection, description, and comparing steps eventually we applied one of the excellent algorithms which is SURF to implement the real time sign recognition.

There are three steps for sign recognition: the first step is interest point detection, the second step is interest point description feature vector extraction and the last is feature vector comparing between two images. We save the usual public sign in our database. The public sign which are to be used in our database having lots of training points, each public sign has unique training points. From this unique points, system is capable of to identified which type of public sign so we loaded number of public sign in our database with unique training points. Whenever after initializing and the opening of HD camera which is placed on one side of our spect, this camera will take continuously video frame and this video will delivered to Edison chip. Thus algorithm will detect public sign which had in video frame. As we stated earlier, each public sign has unique training points. So, if the public sign which in video frame, detected by our algorithm as interest point and extract all those unique training points and at a same time suppose if the number of matching points more than threshold limit. Henceforth system knows which type of public sign is this.

The algorithm which we are implemented in our software is able to identify any public sign. Thus, whenever our system is activated by user, the algorithms extract all the unique key points and key feature vector of the object sign. So it can conceive the sign through unique key training points. No matter the sign is built in or not**.** Knowing to Edison is mighty capability of computation and convenient access of local memory. The SURF algorithm can run with eace and gain real time sign recognition. However any type of public sign comes across the HD camera, system will matched the public sign. Henceforth system will generate voice instruction by extracting the public sign and corresponding voice instruction will delivered to user with the help of wireless headphone.

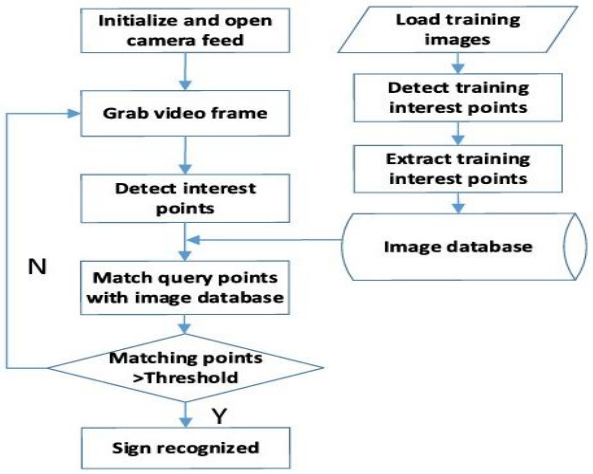

Fig.3 Flow Chart for detecting the video stream

3. CONCLUSION

This paper introduces a standard system of smart glass that is light weight and smart for visually impaired people who would wish to have vision to deal with the environment. We have also described and demonstrated how the smart glass was designed, which includes hardware design and software design. And again, we have also implemented many excellent image processing techniques and object a recognition algorithm that makes the lightweight smart glass system more smarter for use. The system that we have introduced can detect and recognize the object in real time. The smart glass would be very useful for the visually impaired people in their city life. And in the future, we will be implementing more useful applications in the smart glass system, such as talking to Wikipedia, Google, voice guidance and etc.

4. ACKNOWLEDGEMENT

The making of the seminar needed co-operation and guidance of a number of people. We therefore consider it our prime duty to thank all those who had helped us through their venture. It is our immense pleasure to express our gratitude to Prof. D. D. Shirbhate as guide who provided us constructive and positive feedback during the preparation of this seminar we express my sincere thank to the head of department Prof. J.H.SATURWAR and all other staff members of CSE department for their kind co-operation. We would like to thank Dr. A. W. KOLHATKAR, Principal of our institution for providing necessary facility during the period of working on this report. We are thankful to our friends and library staff members whose encouragement and suggestion helped us to complete our seminar.

We are also thankful to our parents whose best wishes are always with us.

REFERENCES

[1]. Feng Lan, Guangtao Zhai and Wei Lin Institute of Image Communication and Information Processing, Shanghai Jiao Tong University, Shanghai, China.-

Lightweight Smart Glass System with Audio Aid for Visually Impaired People 2015.

[2]. Minqi Zhou and Vijayan K Asari, "Speeded-up robust features based moving object detection on shaky video," in Computer Networks and Intelligent Computing, pp. 677–682. Springer, 2011.

[3]. Zhijie Zhang, Chongxiao Cao, Ruijie Zhang, and Jianhua Zou, "Video copy detection based on speeded up robust features and locality sensitive hashing," in Automation and Logistics (ICAL), 2010 IEEE International Conference on. IEEE, 2010, pp. 13–18.

[4]. Herbert Bay, Andreas Ess, Tinne Tuytelaars, and Luc Van Gool, "Speeded-up robust features (surf)," Computer vision and image understanding, vol. 110, no. 3, pp. 346–359, 2008.

[5]. Ana Cris Murillo, Jos´e Jes´us Guerrero, and C Sagues, "Surf features for efficient robot localization with omnidirectional images," in Robotics and Automation, 2007 IEEE International Conference on. IEEE, 2007, pp. 3901–3907.

[6]. "Visual impairment and blindness," http://www.who.int/mediacentre/ factsheets/fs282/en/.