

Blind Navigation System Using Image Processing and Embedded System

¹Mugdha Surve, ²Priyanka Tambe, ³Sayali Walke, ⁴Pranoti Mane

Department of Electronics and Telecommunication, Savitribai Phule Pune University
Email: ¹Mugdhasurve88@gmail.com, ²priyanka.tambe27@gmail.com, ³sayali.w2012@gmail.com,
⁴Pranoti.mane@mescoepune.org

*Modern Education Society's College of Engineering, Pune, Maharashtra, India
*www.mescoepune.org

Abstract— This paper presents an automatic road sign detection and recognition system that supported a procedure model of human visual recognition process. Road signs are usually placed either by the side or above roads. They provide necessary data for guiding, warning, or regulation the behaviours folks so as to make journey safer and easier. The projected recognition system is motivated by human recognition process. Here, because of the alert messages the visually impaired person is navigated safely inside town limits.

Keywords— Blind Navigation System, Traffic Sign Board Detection and Recognition, SURF Feature

I. INTRODUCTION

For achieving dreams, goals and objective in life, independence plays an important role. Visually impaired individuals find themselves hard to go out independently. There are thousands of visually impaired people in this world who are usually in need of helping palms. For decades, the white cane has become a well-known attribute to blind people's navigation and later efforts have been made to enhance the cane by adding a different sensor. Blind people face problem when they walk on the street or stairs using a white cane, but they have sharp haptic sensitivity. The digital walking stick will assist the blind people by supporting extra handy manner of existence. There are numerous steering structures for visually impaired travelers to navigate quickly and thoroughly against boundaries and different dangers faced. Commonly, a blind user has a white cane or a steerage canine as their mobility resource. With the advances of modern technology many distinctive kinds of devices are support mobility of blind, known as Electronic Travel Aids (ETAs). The essential feature of ETA for the blind person is to get statistics at the form of the street and the placement of limitations when they are in unknown locations. With these facts, they need to arrive at their locations, warding off unexpected boundaries. The principle intention of this paper is to make contribute our knowledge and offerings to the people of blind and disable society.

II. LITERATURE SURVEY

The result of survey carried in India suggest that India is the home of the largest number of blind people in the

world [5,6]. Out of the 37 million blind people all over the globe more than 15 million people are in India. For supporting to avoid obstruction visually impaired people commonly use white canes or guide dogs. Guide dogs are of restricted assistance for finding the way to a distant locality, referred as "way finding" [10].

At present numerous devices are available for offering guidance to a distant location but these are either costly or make use of Braille interface. Blind people can get data from the unwilling interaction with entities, persons or animals, by exploring the environment and using their hands to recognize the shape of an object, moreover, blind people can sense other features of the objects as temperature, texture, weigh and though the tact has certain limits in confront of sight, it has a very significant function to unveil to blind persons the world around them. There are many systems which are designed to help navigate the visually impaired.

A. Navigation system using Sensors or RFID:

1] SESAMONET (Secure and Safe Mobility Network Following systems are mainly related with sensors:

2] C-5LaserCane[3]

4] Mowat Sensor[3,7]

5] Sonic Path Finder [3,7]

6] Meldog[1,2]

7] Navbelt[3]

8] Andò used a multisensory approach to guide the blind people in navigating through certain urban areas [4].

B. GPS based Navigation system: These systems are based on data from the GPS maps and Geographic Information Systems (GIS)

1. Way finder Access (Way finder Systems AB)

2. Trekker and Braille Note GPS (Human Ware)

3. MobileGeo (Code Factory)

4. Drishti (University of Florida) [8]

5. Wearable Audio Navigation (SWAN) System developed by Georgia Tech [9].

C. Navigation System using image processing

Another system using vision-based positioning to guide the blind people has also been proposed. These systems use image processing techniques to enable the system to identify the path to be taken and the obstacles in the path.

1. An Assistive-Guide Robot: Eye dog

III .METHODOLOGY

BLOCK DIAGRAM

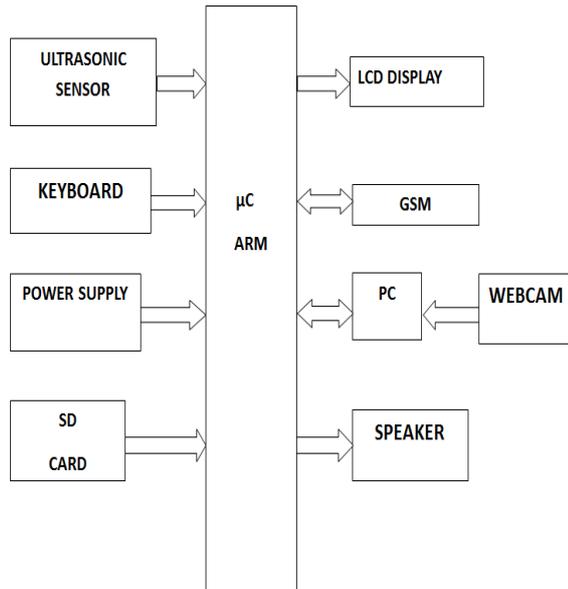


Fig.1 Proposed Block Diagram

The LPC2138 microcontroller is based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high-speed flash memory ranging from 32 kB to 512 kB.

The ultrasonic sensor deals with Doppler Effect. The transmitter transmits the sign in one bearing. This transmitted signal is then reflected back by the obstruction and received by the collector. To calculate the distance between the ultrasonic sensor and the obstacle, the total time taken for the signal to get transmitted and to received back will be used. GSM (Global System for Mobile correspondence) is an advanced portable telephony framework. GSM utilizes a variety of time division various access (TDMA) and is the most broadly utilized of the three computerized remote phone advances (TDMA, GSM, and CDMA).It works at either the 900 MHz or 1800 MHz recurrence band.

IV. EXPERIMENTATION

A. Matlab Flow

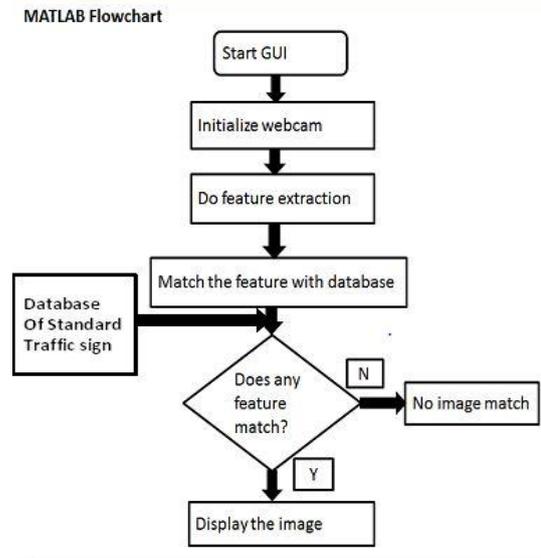


Fig.2 Flowchart

B. Algorithm

- ❖ For all database image:
 - read image
 - rgb2gray
 - detect SURF Features
 - extract features
 - save in database
- ❖ For matching the corresponding points between two images:
 - initiate the camera
 - take snapshot
 - detect SURF Features
 - extract features
 - match features with database

V. RESULT AND DISCUSSION

The overall intention for people with visual impairments is to allow them to experience their surroundings and turn out to be as unbiased as possible. Therefore, we are designing the blind navigation system that is portable and capable to assist them pass the roads and avoid accidents of their outdoor tours. For that, we have studied hardware required i.e., GSM module, interfacing of keypad and liquid crystal display with LPC2138 and “Matlab” that's used for image processing. We've written a Matlab code for video acquisition, taking snapshot and for detection and recognition of images using SURF. Results are shown below:

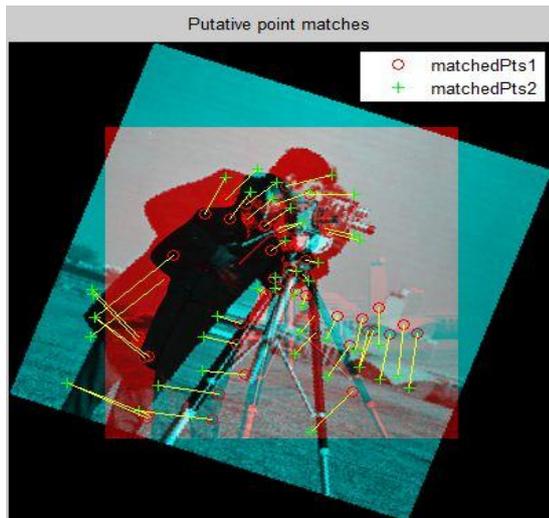


Fig.3 shows corresponding points between two rotated and scaled image

We can say that, the system is on this way to turn out to be a practicable answer for assisting in the group and navigation for the blind and partially sighted individuals. This will permit the blind to save money and avoid quite a few fees since the difference to hold and pay the guide dog or human guide is pretty massive. The method will increase their self-assurance enabling them to move without help in outdoor spaces and getting to be a more normal person within the society.

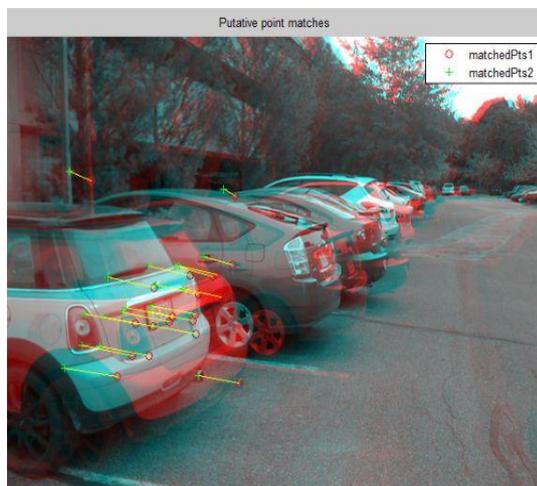


Fig.4 shows corresponding points between two images using Harris feature

VI. CONCLUSION AND FUTURE SCOPE

The proposed navigation system has been developed which will enhance the unbiased mobility of blind individuals. This paper deals with traffic sign board detection and recognition in video stream using Matlab. In point out approach, "SURF" characteristic is used for extracting the features. It approximates and even outperforms earlier proposed scheme with appreciate to repeatability, an area of expertise and robustness, also able to compute and compare much faster. With the

support of image processing, we are able to differentiate between different traffic sign and thus alert the person as an alternative of simply beeping the buzzer. Additionally, we're planning to implement ultrasonic sensor based voice alert system. As soon as distance crosses the threshold the user is alerted accordingly.

For future, we have planned to extend it to GPS tracking device in order to provide precise location of user. We expect that, the complexity of traffic sign detection and recognition systems will decrease in the future, as technology advances. With the advancement of technology, an excessive exceptional sensor turns into less expensive and will be available in mass production. If in the future, every blind navigation gadget is equipped with a high resolution coloration camera, GSM module, a GPS receiver and other sensors, the problem of traffic signal detection will be infinitely easier than its far now. However, the development will probably continue slowly, because of the persistent need to limit manufacturing prices.

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