A SURVEY OF NAVIGATION SYSTEM FOR VISUALLY IMPAIRED USING MULTIMEDIA

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Abstract— In India, there were 7.2 million blind people in 1990, which rose to 8.8 million in 2015, making the country the home of almost a quarter of the total 36 million blind people. Blind persons encounter obstacles, humps, crowd, animals on road etc while on walk. A survey of navigation systems to assist the visually impaired and blind is conducted. The study highlights various features, tools, classifiers and technologies used for real time assistance. Also focus is on challenges and issues. It helps for development of tools to assist the visually impaired and blind for smoother, safer and hassle-free real-time navigation. The literature review reveals that there are no much efforts which can assist the blind to a greater extent so that the dependence on others is almost reduced. The state-of-the-art mobile phones can be loaded with an app which will be able to grab the scenes continuously, analyze them for the presence of obstacles and help the blind to overcome the obstacle.

Keywords— obstacle detection, Navigation system, smartwatch, sensors, Geo2Tag platform, talking tactile map, NFC, GNSS.

I. INTRODUCTION

There have been many attempts of object detection and guidance for the visually impaired. The need for object detection for a blind person is very important, because whenever the person is in an environment, the knowledge of basic objects in the surroundings, their locations, identification, positions etc. can not only enable the visually impaired person to be environment, aware to an extent, but also could be very useful, and sometimes lifesaving. Smartphones are equipped with built-in sensors (video cameras, accelerometers, gyroscopes, barometers, etc.) capable of collecting unique patterns that can be exploited. Carefully designed applications can put powerful solutions in the hands of many people improving their lives in a significant manner. In addition to its simplicity, the 2D image model of the intersection has the added advantage of providing metric information relative to the specific features that matter to a blind or visually impaired traveler – namely, crosswalk marking patterns. The 2D images are used to detect and locate crosswalks, but these projects have the limitation that they analyze images one at a time. This limitation forces the user to capture the entire crosswalk of interest in a single video frame, which can be challenging for users who don't have enough vision to know where to point the camera.

II. LITERATURE SURVEY

Ombretta Gaggi et al. [1] propose a system able to offer an enhanced route navigation system, while at the same time gathering quality data through smart watches. Ubiquitous sensors are used to collect data, while smart watch uses luminosity sensors and accelerometer for light intensity finding the acceleration of object. Even more interesting, they have endowed system with an interaction paradigm based on vibration patterns so as to guide the user without the need for looking at the device.

Yueng Delahoz and Miguel A. Labrador, [2] propose a smartphones which is equipped with built-in sensors (video cameras, accelerometers, gyroscopes, barometers, etc.) capable of collecting unique patterns that can be exploited to prevent/detect falls. It uses smoothening method which consists of resize image ,grayscale convert and apply filter, next edge detection and floor detection algorithm used to give guidance for blind.

Siddharth Kalra et al. [3] propose a wearable eyeglass equipped with CMOS camera for visual input, here image is divided in to positive and negative. Later HAAR cascade classifier is applied to detect object and earplugs for the Harmonic Acoustic Feedback.

Kuei-Chun Liu et al. [4] design and implement an assistive system for visually impaired persons while using Android smart phones. The system uses Voice Helper (VH) for voice based guidance and also navigation is provided for walking and riding, which is based on Google Maps. It supports more detailed voice guidance for the distance to a destination and directions from person to object.

Zdenek Mikovec et al. [5] propose the plugin for Integrated Interactive Information Visualization Environment (IVE tool) for providing navigation for visually impaired. IVE tool and visualization plug-ins were used for pre-processing and for visual analysis of collected data from the usability study of mobile indoor navigation application.

Rosa Andrie Asmara et al. [6] propose a mobile app based system to guide someone to walk straight using the motion sensors on the Smartphone and audio-based guidance. The low-pass filter was applied to magnetometer and accelerometer data to reduce noise that resulted when the user walks.

Laviniu Ţepelea et al. [7] proposes an android application for Smartphone, especially made to assist blind persons. The application uses MEMS sensors from a Smartphone and also the information received from a few external sensorial modules. The hardware modules form together an assistive portable system. Communication between Smartphone and external modules is made via Bluetooth and Wi-Fi.

Kirill A. Kulakov et al. [8] describe the common applications architecture and utilized technologies, which consists of route parts and roads, as well as information about accessibility of objects stored in the database using user scenarios, service functions, use of Geo2Tag platform and Open Street Map with its libraries.

Muzaireen Minhat et al. [9] proposed solution with name 'talking tactile map' which has assistive technologies that is tactile map that consists of Braille labeling and features annotation. A tactile map with embedded buttons that will connect to TacTalk mobile application via Bluetooth to play the audio files once the button is pressed by the user.

N.Mahmud et al. [10] propose the navigation system for visually impared which uses an ultrasonic device to determine the range of obstacles and also a microcontroller to act accordingly; it includes warning system through voice and vibration.

Aura Ganz et al. [11] has discussed a Smartphone running PERCEPT-II application the user interacts with the environment by touching the Near Field Communication (NFC) tags. PERCEPT-II client downloads from the server the navigation instructions and interacts with the user through the "vision free" interface.

Qinghua Zeng et al. [12] has presented smartphone based device used to detect indoors, the pedestrian dead reckoning algorithm based on the accelerometers and gyroscopes the initial location and the heading direction values are obtained with the help of the mobile image sensor and the indoor electronic map. The GNSS (magnetic sensor signal, and the global navigation satellite system) and the magnetic sensor are introduced in the system to assist the inertial process of the navigation in outdoors.

III. DISCUSSION

In [1], [8] are used for data collection, [2] uses Geo2tag whih is free source, work very fast and survive under massive request flow. Light variation problem is solved by [1] using luminous sensors where others are not focused on it. Filtering of image is done in [2], [6]. [6] is effective which used low pass filter as compared to [2]. The most important part of implementation is obstacles recognition which is done in [2], [3], [7], [9], [11], [12]. [3] use HAAR cascade classification , [7] use MEMS sensors which is hardware based and need to carry , [9] use Braille labeling which take lot of time and limited to specific location and it may not give accurate results during moderate light, [11] use NFC tag and require hardware to recognize , also has limited range.

[12] use dear rekoning algorithm for detection , out of all these [3] work better and accuracy is more. Guidance through voice is made enable in [4] , also use google maps for accurate navigation but it cannot provide accuracy in local areas.

IV. CONCLUSION

The purpose of this work is to capture the videos, conversion to images, detection and recognition of objects from the scene, estimating the distance and direction from the current position and finally uttering the identified parameters. This process helps the visually impaired to navigate in a real-world environment which is dynamic in nature .The challenges include the real-time conversion of video to images for faster object detection and recognition.

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