SMART NAVIGATION APPLICATION FOR VISUALLY IMPAIRED PEOPLE

2022-277

Project Proposal Report

Jathusanan.E

B.Sc. (Hons) Degree in Information Technology
(Specialization in Software Engineering)

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Declaration

I declare that this is my own work, and this proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or institute of higher learning, and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

Name	Student ID	Signature
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The supervisor/s should certify the proposal report with the following declaration. The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor: Date:

Abstract

People who are blind or visually challenged face unique risks and hazards on the road. This includes participation as a car, cyclist, or pedestrian. Methods and materials: A review of worldwide research studies and a study by the author, in which 45 people with Usher syndrome were asked about their accident rates and reasons as a driver, bicycle rider, and pedestrian, demonstrate these hazards. Furthermore, fundamental legal information has been developed to demonstrate the visual circumstances of people with vision impairment for road traffic participation. One of the results of vision loss is being uncomfortable with regards to safety while on the road or traveling independently. People who are disabled face a number of challenges when it comes to self-navigation in unfamiliar outdoor environments. Safe navigation on sidewalks is the most important requirement. There are many skills and aids thought of by professionals operating within the field of orientation and quality to facilitate visually impaired folks going outdoors safely. These include the utilization of canes, guide dogs, and mobility training. There are many studies that contemplate outdoors issues as well as techniques developed for safe navigation. According to the findings of the investigations, blind and visually impaired people are more vulnerable to high dangers of traffic. These dangers can be mitigated by the proposed system discussed in this study. The proposed system will be working on creating an Internet of Things (IoT) device to assist visually impaired and blind people to go to the nearby walking lanes using image processing. Additionally, it will assist them not to get out of the walking lane and will alert them when someone is about to hit them while walking. This proposed study uses IoT with image processing and recommendation learning to achieve the expected outcome so that visually impaired and blind people can walk safely on the road.

Keywords: Recommendation learning, Image processing

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1. Introduction

1.1. Background & Literature Survey

To begin with, vision is the most important aspect of human psychology, since it accounts for 83 percent of the knowledge that a person acquires from the environment (Elmannai & Elleithy 565). However, many of us have major sight problems that prevent us from traveling alone. According to a World Health Organization (WHO) estimate from 2018, there are around 1.3 billion individuals worldwide who are visually impaired, with 39 million being blind and 246 million having poor vision. As a result, these individuals need to employ a number of tactics and instruments to aid in their mobility. The walking cane, also known as the "white stick," and the guiding dog are two of the oldest visually impaired aids. Despite their usefulness, these tools have significant drawbacks, as discussed later in this work (Shoval, Ulrich, & Borenstein 9). However, the rapid growth of modern technology has resulted in the introduction of higher systems like aided vision sensible glasses and the smart cane, which will provide intelligent navigation skills to the blind. With the advancement of technologies, many new ways have been introduced to assist visually impaired people and blind people to walk safely on the road. This proposed system will support image processing and recommendations to help them more efficiently. Some of the related studies are discussed below.

In this paper "Wearable Smart System for Visually Impaired People", the authors tended to gift a wearable good system to assist visually impaired people (VIPs) walk by themselves through the streets, navigate public places, and get assistance. The main components of the system are a microcontroller board, varied sensors, cellular communication and GPS modules, and a star panel. The system employs a group of sensors to trace the trail and alert the user of obstacles ahead of them. The user is alerted by a buzzer sound and vibrations on the wrist; this is useful if the user has hearing loss or is in a noisy environment. In addition, the system alerts folks within the surroundings once the user stumbles over or needs assistance, and therefore the alert, together with the system location, is distributed as a message to registered mobile phones of family members and caregivers. In addition, the registered phones are accustomed to retrieving the system location whenever needed and activating a timer for the VIP's pursuit. We tend to test the system model and verify its practicality and effectiveness. The projected system has a lot of options compared to different similar systems. We tend to expect it to be a useful gizmo to boost the standard of VIPs' lifetimes [1].

According to the authors of "Autonomous walking stick for the blind using echolocation and image processing," a good walking stick, the Assistor, facilitates blind people to spot obstacles and supply help to achieve their destination. The technology of echolocation, image processing, and a navigation system were used to support the assistor's works. The assistant might function as a possible aid for people with visual disabilities and therefore improve their quality of life. There's plenty of labor and analysis being done to seek out ways to boost life for visually challenged people. There are multiple walking sticks and systems which help the user to maneuver around indoor and outdoor locations; none of them gives runtime autonomous navigation together with object notice ion and identification alerts. The assistant uses inaudible detectors to echo sound waves and detect objects. A picture sensor is employed to spot the objects ahead of the user and for navigation by capturing runtime pictures, and a Smartphone app is used to navigate the user to the destination using GPS (Global Positioning System) and maps [2].

According to the authors of "IoT based smart walking cane for typhlotics with voice assistance," locomotion is inevitable for human beings. The biggest drawback for the blind is movement from one place to another, grade crossings, and identification of their current location. In case of their venture into an unacquainted atmosphere, it's a menace to them and their fellow mates too. Therefore, it is essential for the family members and organizations of the blind to understand the present location of the visually challenged. A good walking cane act as an Electronic Travel Aid (ETA). A good walking cane solves the problem by providing grade crossing guidance and the visually impairer's current location. Obstacles are detected exploitation inaudible sensors; a world positioning system (GPS) is employed to point out the current location of the visually challenged; level crossing guidance is provided by a reflective below red (RIR) sensor. The present position of the blind is uploaded to the cloud through the Wi-Fi module. Navigation info and directions are intimated to the user of the good walking cane by text-to-speech convertor through a stereo headphone. The buzzer and vibrating circuit also aid in finding space in the screeching atmosphere. This good walking cane meets the obligatory needs of the visually impaired to navigate similarly by recognizing their position and orientation [3].

According to the authors of “Efficient Multi-Object Detection and Smart Navigation Using Artificial Intelligence for Visually Impaired People”, visually impaired people face various difficulties in their daily life, and technological interventions might assist them to fulfill these challenges. This paper proposes a synthetic intelligence-based automatic helpful technology to acknowledge completely different objects, and auditive inputs are provided to the user in real time, which supplies higher understanding to the visually impaired person regarding their surroundings. A deep-learning model is trained with multiple pictures of objects that are extremely relevant to the visually impaired person. coaching images are increased and manually annotated to bring a lot of strength to the trained model. Additionally, to laptop vision-based techniques for object recognition, a distance-measuring detector is integrated to form the device more comprehensively by recognizing obstacles whereas navigating from one place to another. The auditive info that's sent to the user when scene segmentation and obstacle identification is optimized to get a lot of information in less time for quicker process of video frames. the typical accuracy of this projected methodology is 95.19% and 99.69% for object detection and recognition, respectively. The time complexness is low, permitting a user to understand the encircling scene in real time [4].

According to the authors of “Efficient Multi-Object Detection and Smart Navigation Using Artificial Intelligence for Visually Impaired People”, nowadays technology is rising daily in numerous aspects so as to supply versatile proposes good Cane (Stick) for visually handicapped person. However, there's no such reasonably smart system to navigate a blind person and facilitate emergency situations. During this paper, user friendly device is projected that may determine the obstacles within the path exploitation inaudible sensors. During this system visually handicapped people will navigate through a cane interfaced with a robot application. A blind person can establish voice decision or SMS to a predefined variety simply by pressing the emergency button on cane using GSM module. In addition, folks will get notified as Facebook is standing updated with an emergency alert. This method develops an android application that is wise and user-friendly. whereas walking public place throughout nighttime, the blind person can use cane as an electric lamp that illuminates automatically [5].

According to the authors of “A Design review of Smart Stick for the Blind Equipped with Obstacle Detection and Identification using Artificial Intelligence,” visually impaired people notice it tougher to move regarding severally attributable to their compromised vision. Moreover, a blind person’s capability to navigate during a given setting, together with their ability to prepare their daily activities are important to their health and wellbeing. Organizing any commonplace activity is particularly difficult for a blind man/woman if he/she has not learned {to distinguish |to completely differentiate |to tell apart} between different things like drug containers and prepacked goods, simply by feeling with the hands. A lot of gloomy reality is that there are tens of several visually impaired persons worldwide who need to bear such expertise and are captivated with others for his or her welfare and happiness. The encouraging news, however, is that the speedy advancement in technology has seen the innovation of higher systems for helping the disabled, together with the blind, akin to the AI glasses, which might give intelligent navigation capabilities to the blind. This paper reviews the look of a smart cane, i.e., a sensible stick for the blind, equipped with obstacle recognition exploitation AI Technologies adds a lot of virtual visibility in their journey. It shows that such a stick is an important boon to the blind [6].

According to the authors of “Smart Eye for Visually Impaired-An aid to help the blind people”, they presented a plan of developing a sensible system which might assist the visually impaired folks in their daily activities. Actually, there are several challenges round-faced by visually impaired people. In most cases, they need constant support at most events, particularly in their day-to-day activities. A number of the most important challenges embrace the issue of moving from one place to a different while not with the help of someone. different challenges include difficulty in recognizing people, police investigation obstacles, etcetera so as to count avert this situation, we tend to propose a “smart eye system” during this work. The device could be a voice enabled system that will direct the blind person in their day to day works. The device combines the assorted offered technologies and integrates them into one useful device that may be employed by the visually impaired. The paper discusses regarding the look of such a system and therefore the challenges concerned in coming up with the device [7].

According to the authors of "Shopping and tourism for blind people using RFID as an application of IoT," they aimed to supply a service for blind people, based on the assumption that visually impaired folks would like to buy independently without help from others. For this to happen, once a visually handicapped person walks through a mall, he or she would want to understand the outlets within the close space and what these shops provide. The proposed software package, powered by RFID technology, aims to assist blind people in searching by indicating their location, providing useful information about each nearby store, and guiding them to their desired destinations. The software can also offer a notification service counting on the present time, the calculable needed shopping time, and therefore the closing time of a specific store, to apprise the user sufficiently earlier to make their desired purchases. A high share of success in software packages has been achieved and made through this research [8].

1.2. Research Gap

There are existing systems that can assist visually impaired people and blind people to walk safely on a road. But they just give the details and do not assist in all the ways to help them walk safely. The following table compares the proposed study with existing studies in order to find the research gap.

Features	Smart cane	Research A [6]	Research B[7]	Our System
Image processing	✓	✓	✓	✓
Walking lane recommendation	✗	✗	✗	✓
Obstacle alert	✓	✓	✓	✓
People alert	✓	✗	✓	✓

Table - 1.3.1

Comparison Table

1.3. Research Problem

The ability of visually challenged individuals to perceive information through their sense of vision is the first problem identified. People who are blind or partially sighted rely on the senses of touch, hearing, smell, and taste. They should challenge themselves daily to cope with their diminished vision in a world where the majority of people interpret their surroundings through vision.

Visually impaired people always find it difficult to walk alone on a traffic road or on a normal road without any assistance. Hence, a solution is needed to overcome this issue to help them walk alone by suggesting the walking lane nearby and helping them not get out of the lane, along with obstacles and people detection.

There are various mobile applications available for the visually impaired. Their main purpose is to use the mobile microphone to open applications and do a variety of functions. There are various other areas that have yet to be investigated but have the potential to assist visually impaired people via a mobile application.

2. Objectives

2.1. Main Objective

Help visually impaired and blind people to walk in correct walking lanes to avoid accidents and to assist them to find obstacle and people coming before them using the IoT device created.

2.2. Sub Objectives

Following are the specific objectives for this proposed study.

- Creating the IoT device.
- Creating image processing system integrated with the device.
- Develop a recommendation model to suggest them walking lanes.

3. Methodology

The proposed study will go through some stages like training of image processing and recommendation model with the training data set collected from internet and other data stores related to blind people. The image processing will be done by image acquisition, preprocessing and then training steps will be followed. In image process, it's outlined because the action of retrieving a picture from some supply, sometimes a hardware-based source for processing. It's the primary step within the workflow sequence because, while not associating image, no processing is possible. In image acquisition victimization pre-processing appreciate scaling is done. Recommendation engines are a taxonomic category of machine learning that typically handles ranking or rating product / users. Loosely defined, a recommender system could be a system which predicts ratings a user would possibly provide to a selected item. These predictions can then be hierarchical and come back to the user. After this, the extracted data will be sent to the recommendation model which will assist you to walk correctly in the walking lane by voice commands through the IoT device that will be created and integrated with the model trained.

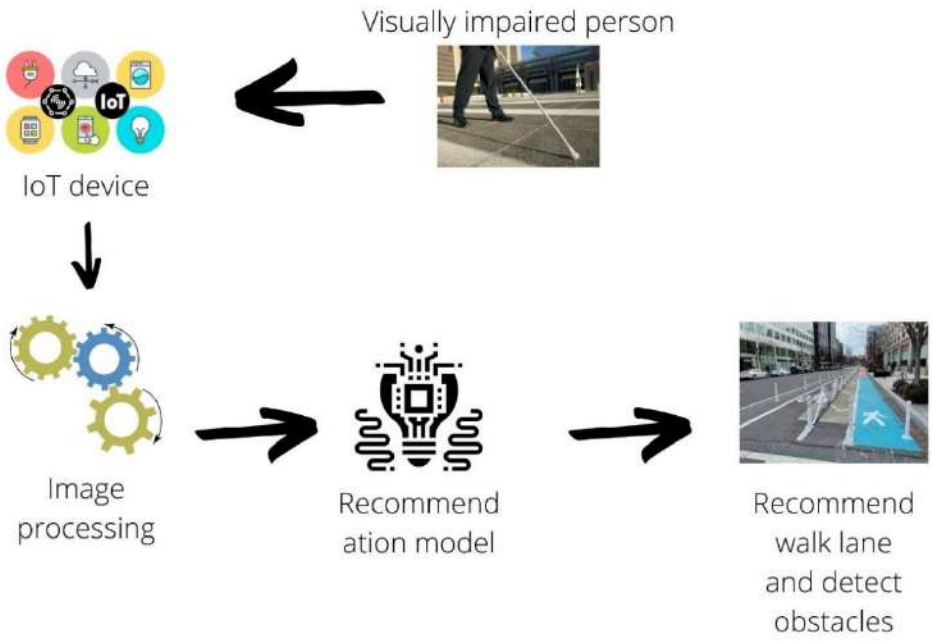

Figure - 3.1

System Overview Diagram

4. Description of personal facilities

Member	Component	Task
Jathusanan.E	Walk lane detection and guiding through the lane.	1. Information gathering and Analysis 2. System Design 3. ER Mapping and Database design 4. Functions • From the live video through the inbuilt camera of the system, the system can detect the walk lanes that are present in the main roads, parks, etc. • When someone comes from the opposite direction and tries to clash with them, the system warns them. 5. Unit, Integration, and system testing Documentation

Table - 4.1

Personal Facilities

5. Budget and Budget Justification

Due to the data gatherings, traveling and for stationeries related to the research, there will be some costs.

Justification	Overall estimated cost
Data charges for research	10000
Print outs related to the study	9000
Travel charges related to research data collection	5000
Other member requirements	6000

Table – 5.1

Budget Justification

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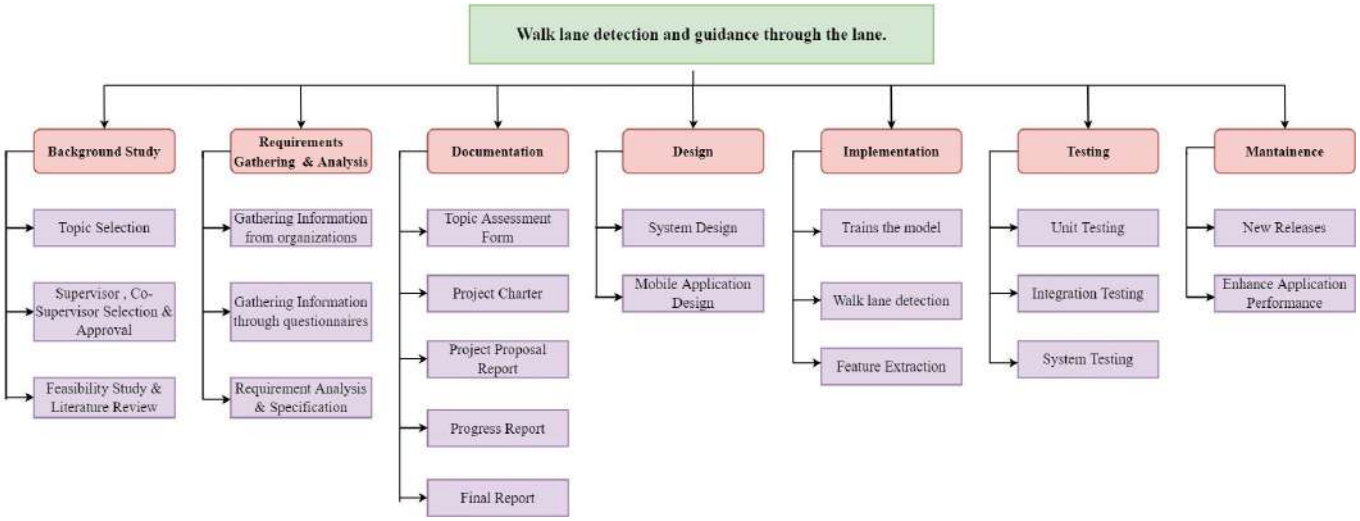
Appendices

Appendix A: Work Breakdown Structure



Appendix B: Gantt Chart