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RFID- Based Mobile Indoor Assistive Navigation and Localization for Visually Impaired People

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Abstract:

Vision is one of the very essential human senses and it plays the most important role in human perception about surrounding environment. Several techniques are proposed to get location information in buildings such as using a radio signal triangulation, a radio signal (beacon) emitter, or signal finger printing also existing assistance systems which are limited to obstacle detection and path finding. Using radio frequency identification (RFID) tags is a new way of giving location information to blind people. Here the proposed system aims to introduce a central function of a new RFID-based assistive navigation and localization system to help blind and visually impaired people with indoor independent travel. The system detects dynamic obstacles and adjusts path planning in real-time to improve navigation safety. First, focus on develop an indoor map editor to parse geometric information from architectural models and generate a semantic map consisting of a RFID based pre implemented tags in the indoor area. By leveraging the reader service, then design a path alignment algorithm to bridge the data to mobile device and semantic map to achieve semantic localization by using Bluetooth mobile APK. Using the on-board RFID reader, the system develops efficient obstacle detection and avoidance approach based on a time-stamped map Kalman filter (TSM-KF) algorithm. Finally, field experiments and blind subjects demonstrate that the proposed system provides an effective tool to help blind individuals with indoor navigation and localization.

Keywords — **RFID, TSM-KF, SLAM, VFH**

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INTRODUCTION

Vision is one of the significant human faculties for picking up information on the general condition. The nonattendance of vision makes unassisted route, object distinguishing proof, and direction in new settings a difficult assignment. Accord- ing to a report by the World Health Organization (WHO), 314 million people worldwide suffer from visual impairment. The purpose behind visual hindrance is normally eye malady or uncorrected refractive mistakes. Out of the 314 million outwardly disabled individuals, 45 million are visually impaired. Visual deficiency is an issue that is common and ever expanding because of the maturing populace. In more seasoned individuals, there is a higher danger of visual weakness that expands the trouble of self-ruling portability. For some individuals with visual disabilities, help assumes a significant function in social interest. The nonattendance of fitting assistive gadgets for individuals with visual debilitations makes them excessively subject to their relatives. In addition, the cost of rehabilitation might not be affordable for people in low- income countries due to a lack of employment. Assistive tech- nologies are powerful tools for rehabilitation, which improve the functioning, participation, and independence of visually impaired people.

A. Navigating Around The Places

The biggest challenge for a blind person, especially the one with the complete loss of vision, is to navigate around places. Obviously, blind people roam easily around their house without any help because they know the position of everything in the house. People living with and visiting blind people must make sure not to move things around without informing or asking the blind person.Some electronic travel aids (ETAs) have been proposed by researchers to assist visually impaired people with mobility and to increase their speed while navigat- ing. According to a report from USA, assistive technologies for mobility reduce the need for support services. The different forms of existing ETAs are wearable devices, smart canes, and handheld devices. Nav Guide, Guide Cane, K-Sonar, Ultra cane, and electronic mobility cane (EMC) are ETAs that make use of ultrasonic sensors to detect objects in the surrounding environment. However, they are limited to knee-level obstacle detection and fail to detect descending staircases. Although ETAs are available to help visually impaired people, the acceptance of ETAs is low. However, the low acceptance rate does not mean that visually impaired people resist adopting electronic assistive devices; instead, it indicates that there is a need for further research to improve the adaptability and usability of ETAs. The existing ETAs are less popular among potential users because they have poorly designed user interfaces and are limited to navigation purposes, functionally complex, heavy to carry, costly, and lack object identification functionality, even in known indoor environments. In addition, the existing ETA systems are limited to helping individuals avoid obstacles. For example, a person might be looking for a sofa to sit on; however, the existing ETA systems are limited to finding an obstacle free path and do not provide information on indoor settings. One of the reasons for the lower acceptance of existing ETAs is the lack of communication between the users of ETAs and their developers. The proposed project mainly focuses on describe a navigation and location determination system for the blind using an RFID tag. Each RFID tag is programmed upon installation with spatial coordinates and information describing the surroundings. This allows for a self- describing, localized information system with no dependency on a centralized wireless infrastructure for communications.

Since the number of this group is small, the big companies don't focus mainly on investing in its needs. It will surely act like a visual indicator to them. In such a way it's a navigation and location determination system for the person with visual impairment using RFID tags and Braille for those who do not capable of listening. Each RFID tag is programmed upon installation with and information describing the surroundings. With an established RFID infrastructure blind peoples will gain the freedom to explore and participate in activities without external assistance. An established RFID infrastructure will also enable advances in robotics, which will benefit from knowing precise location. RFID-system with an RFID reader integrated into the user's handling with a circuit design to the user's earphone, and braille for those who are not capable of listen anything which incorporate Android APK. An emphasis is placed on the architecture and design allowing for a truly integrated pervasive environment with minimal visual indicator in future to the outside observer. The system proposes Kalman-filter based location estimation (LE) to significantly reduce the received signal strength index drift, localization error, computational complexity, and deployment cost of conventional radio frequency identification (RFID) in- door positioning systems without any sacrifice of localization granularity and accuracy.Each tag has its own identification (ID) number corresponding to unique coordinates of location and may be either active or passive. Information describing the surrounding can also be programmed in the tag that makes the RFID tagnested grids highly attractive for industrial and other needs. This information, however, may be useful only if localization is provided with high accuracy. An application of the extended Kalman filter (EKF) the extended, quadrature, and particle Kalman filters was recently proposed. A disadvantage of the Kalman filter-based estimators is that noise is required to be white and its statistics and the initial error statistics are known in order for the EKF to be suboptimal.The proposed time-stamped map Kalman filter (TS-KF) scheme can realize automatic pre-planned task and improve the localization and navigation accuracy with eye-to-hand measurement feedback. Moreover, aTS Kalman filter is proposed to obtain smooth pose estimation and reduce the influence caused by noise, ex- ternal vibration and other uncertain disturbances. Due to high repeatability of the RFID based TS-KF; the proposed scheme can achieve high location tracking accuracy. The proposed smart cane users are provided with appropriate tactileand audio feedback for detected obstacles. These reference points help visually impaired people calculate the optimum number of movements to navigate from one point to another. The system helps users identify indoor objects by using radio- frequency identification (RFID) reader and RFID tags. The identification of an object allows a blind person to efficiently and autonomously move from one place to another. This article covers the design, implementation, experimental evaluation, and statistical analysis of the smart cane.

I. LITERATURE SURVEY

A. A SITUATION-AWARE EMERGENCY NAVIGATION AL- GORITHM WITH SENSOR NETWORKS

When emergencies happen, navigation services that guide people to exits while keeping them away from emergencies are critical in saving lives. To achieve timely emergency navigation, early and automatic detection of potential dangers, and quick response with safe paths to exits are the core requirements, both of which rely on continuous environment monitoring and reliable data transmission. Wireless sensor networks (WSNs) are a natural choice of the infrastructure to support emergency navigation servicesAlthough many efforts have been made to WSN-assisted emergency navigation, al- most all existing works neglect to consider the hazard levels of emergencies and the evacuation capabilities of exits. Without considering such aspects, existing navigation approaches may fail to keep people farther away from emergencies of high hazard levels and would probably encounter congestions at exits with lower evacuation capabilities. We formally model the situation-aware emergency navigation problem and establish a hazard potential field in the network, which is theoretically free of local minima. By guiding users following the descend gradient of the hazard potential field, SEND can thereby achieve guaranteed success of navigation and provide optimal safety. The effectiveness of SEND is validated by both experiments and extensive simulations in 2D and 3D scenarios.

MERITS:

Full distributed algorithm to provide users the safest nav- igation paths, as well as an accelerated version that can significantly boost up the speed of the navigation.

DEMERITS: Existing methods simply guide people to the nearest one for the sake of timeliness.

B. MERCURY: AN INFRASTRUCTURE-FREE SYSTEM FOR NETWORK LOCALIZATION AND NAVIGATION

Location awareness enables a variety of emerging applica- tions on mobile devices. For indoor applications, a desirable way of obtaining real-time locations is by combining different sources of positional information, such as the inertial measure- ments, ranging measurements, and map information with an infrastructure-free system that does not rely on any customized hardware. These sources of information can be incorporated into the paradigm of network localization and navigation (NLN). However, there still lacks an infrastructure- free localization system that applies the insights of NLN to effectively fuse different types of information. In this paper, we present the Mercury system, which realizes the key ideas of NLN, including the exploitation of spatio-temporal cooperation and the use of environmental knowledge. We design a real-time belief propagation algorithm to fuse map information with the acceleration and angular velocity measurements as well as the range measurements among different users. We implement this algorithm in the Mercury system, which consists of only smartphones, and carry out experiments to evaluate its localization accuracy.

MERITS:

Mercury provides reliable location information and that spa- tial cooperation remarkably reduces the location uncertainty of users.

DEMERITS:

The performance of mercury is more robust to imperfect.

C. TOWARDS CONGESTION-ADAPTIVE AND SMALL STRETCH EMERGENCY NAVIGATION WITH WIRELESS SENSOR NETWORKS

One of the major applications of wireless sensor networks (WSNs) is the navigation service for emergency evacuation, the goal of which is to assist people in escaping from a hazardous region safely and quickly when an emergency occurs. Most existing solutions focus on finding the safest path for each person, while ignoring possible large detours and congestions caused by plenty of people rushing to the exit. In this paper, we present CANS, a Congestion-Adaptive and small stretch emergency Navigation algorithm with WSNs. Specifically, CANS leverages the idea of level set method to track the evolution of the exit and the boundary of the hazardous area, so that people nearby the hazardous area achieve a mild congestion at the cost of a slight detour, while people distant from the danger avoid unnecessary detours. CANS also considers the situation in the event of emergency dynamics by incorporating a local yet simple status updating scheme. To the best of our knowledge, CANS is the first WSN- assisted emergency navigation algorithm achieving both mild congestion and small stretch, where all operations are in-situ carried out by cyber-physical interactions among people and sensor nodes.

MERITS:

CANS does not require location information, nor the re- liance on any particular communication model

DEMERITS:

It is distributed and scalable to the size of the network with limited storage on each node.

D. EVALUATION OF TWO WIFI POSITIONING SYSTEMS BASED ON AUTONOMOUS CROWDSOURCING OF HAND- HELD DEVICES FOR INDOOR NAVIGATION

Current WiFi positioning systems (WPS) require databases – such as locations of WiFi access points and propagation pa- rameters, or a radio map - to assist with positioning. Typically, procedures for building such databases are time consuming and labour-intensive. In this paper, two autonomous crowd sourcing systems are proposed to build the databases on hand- held devices by using our designed algorithms and an inertial navigation solution from a Trusted Portable Navigator (TPN). The proposed systems, running on smartphones, build and update the database autonomously and adaptively to account for the dynamic environment are also discussed. The main con- tribution of the paper is the proposal of two crowd sourcing- based WPSs that eliminate the various limitations of current crowd sourcing-based systems which (a) require a floor plan or GPS, (b) are suitable only for specific indoor environments, and (c) implement a simple MEMS-based sensors' solution. In addition, these two WPSs are evaluated and compared through field tests. Results in different test scenarios show that average positioning errors of both proposed systems are all less than 5.75 m.

MERITS:

To improved WiFi positioning schemes (fingerprinting and trilateration) corresponding to these two database building systems.

DEMERITS:

Running on smart phones, build and update the database autonomously and adaptively to account for the dynamic environment.

E. RGB-D CAMERA BASED WEARABLE NAVIGATION SYS- TEM FOR THE VISUALLY IMPAIRED,Computer Vision and Image Understanding

In this paper, a novel wearable RGB-D camera based indoor navigation system for the visually impaired is presented. The system guides the visually impaired user from one location to another location without a prior map or GPS information. Accurate real-time egomotion estimation, mapping, and path planning in the presence of obstacles are essential for such a system. We perform real-time 6-DOF egomotion estimation using sparse visual features, dense point clouds, and the ground plane to reduce drift from a head-mounted RGBD camera. The system can store and reload maps generated by the system while traveling and continually expand the coverage area of navigation. The proposed system achieves real-time navigation performance at 28.6Hz in average on a laptop, and helps the visually impaired extends the range of their activities and improve the orientation and mobility performance in a cluttered environment. We have evaluated the performance of the proposed system in mapping and localization with blind-folded and the visually impaired subjects. The mobility experiment results show that navigation in indoor environ- ments with the proposed system avoids collisions successfully and improves mobility performance of the user compared to conventional and state-of-the-art mobility aid devices.

MERITS:

The system generates a safe and efficient way point based on the traversability analysis result.

DEMERITS:

The mobility experiment results show that navigation in in- door environments with the proposed system avoids collisions successfully

F. WEARABLE EGO-MOTION TRACKING FOR BLIND NAVIGATION IN INDOOR ENVIRONMENTS

This paper proposes an ego-motion tracking method that uti- lizes visual-inertial sensors for wearable blind navigation. The unique challenge of wearable motion tracking is to cope with arbitrary body motion and complex environmental dynamics. They introduce a visual sanity check to select accurate visual estimations by comparing visually estimated rotation with measured rotation by a gyroscope. The movement trajectory is recovered through adaptive fusion of visual estimations and inertial measurements, where the visual estimation outputs motion transformation between consecutive image captures, and inertial sensors measure translational acceleration and angular velocities. The frame rates of visual and inertial sensors are different, and vary with respect to time owning to visual sanity checks. Hence employ a multirate extended Kalman filter (EKF) to fuse visual and inertial estimations. The proposed method was tested in different indoor environments, and the results show its effectiveness and accuracy in ego- motion tracking.

MERITS:

A visual sanity check to select accurate visual estimations by comparing visually estimated rotation with measured rota- tion by a gyroscope.

DEMERITS:

The movement trajectory is recovered through adaptive fusion of visual estimations and inertial measurements.

G. ON OSCILLATION-FREE EMERGENCY NAVIGATION VIA WIRELESS SENSOR NETWORKS

Emergency navigation is an emerging application of wire- less sensor networks with significant research and social value. In order to ensure the safe and timely navigation of the evacuees, most of the existing works model navigation as a path- planning problem or movement decision support problem and adopt different metrics, such as the shortest route, the minimum exposure path, and the maximum safe distance. Without sufficient consideration of the dynamics of danger, the existing approaches are likely to cause users to move back and forth during navigation, known as oscillation. Frequent oscillations inevitably result in the user remaining in danger for a longer period of time, amplification of the user's panic, and eventual decrease in the chances of survival. In this paper we take users' oscillations in the dynamic environments into account and quantify the local success rate of navigation using a metric called ENO (Expected Number of Oscillations).Then propose OPEN, an oscillation-free navigation approach that minimizes the probability of oscillation and guarantees the success rate of emergency navigation. To implement OPEN and evaluate its performance through the trace from our system and extensive simulations. The results demonstrate that OPEN outperforms the current state-of-the-art approaches with respect to user safety and navigation efficiency.

MERITS:

To ensure the safe and timely navigation of the evacuees.

DEMERITS:

Frequent oscillations inevitably result in the user remaining in danger for a longer period of time, amplification of the user's panic, and eventual decrease in the chances of survival.

In this paper take user oscillations in the dynamic environ- ments.

H. GROPING: GEOMAGNETISM AND CROWDSENSING POWERED INDOOR NAVIGATION

Although a large number of WiFi fingerprinting based indoor localization systems have been proposed, our field experience with Google Maps Indoor (GMI), the only system available for public testing, shows that it is far from mature for indoor navigation. In this paper, first report our field studies with GMI, as well as experiment results aiming to explain our unsatisfactory GMI experience. Then motivated by the obtained insights, propose GROPING as a self-contained indoor navigation system independent of any infrastructural support. GROPING relies on geomagnetic fingerprints that are far more stable than WiFi fingerprints, and it exploits crow dsensing to construct floor maps rather than expecting individual venues to supply digitized maps. Based on our experiments with 20 participants in various floors of a big shopping mall.

MERITS:

Groping is able to deliver a sufficient accuracy for localiza- tion and thus provides smooth navigation experience.

DEMERITS:

GROPING as a self-contained indoor navigation system independent of any infrastructural support.

I. INTEGRATED ONLINE LOCALIZATION AND NAVIGA- TION FOR PEOPLE WITH VISUAL IMPAIRMENTS USING SMART PHONES

Indoor localization and navigation systems for individuals with visual impairments (VI) typically rely upon extensive augmentation of the physical space or heavy, expensive sen- sors; thus, few systems have been adopted. This work de- scribes a system able to guide people with VI through build- ings using inexpensive sensors, such as accelerometers, which are available in portable devices like smart phones. Previous work suggested that the accuracy of the approach depended on the type of directions and the availability of an appropriate transition model for the user. A critical parameter for the transition model is the user's step length. The current work investigates different schemes for automatically computing the user's step length and reducing the dependency of the approach to the definition of an accurate transition model. Furthermore, the direction provision method is able to use the localization estimate and adapt to failed executions of paths by the users. Experiments are presented that evaluate the accuracy of the overall integrated system, which is executed online on a smart phone. Both people with visual impairments, as well as blindfolded sighted people, participated in the experiments. The experiments included paths along multiple floors, that required the use of stairs and elevators.

MERITS:

The method takes advantage of feedback from the human user, who confirms the presence of landmarks. The system calculates the user's location in real time

DEMERITS:

Automatically computing the user's step length and reduc- ing the dependency of the approach to the definition of an accurate transition model.

J. COOPERATIVE SELF-NAVIGATION IN A MIXED LOS AND NLOS ENVIRONMENT

Investigate the problem of cooperative self-navigation (CSN) for multiple mobile sensors in the mixed line-of- sight (LOS) and non line-of-sight (NLOS) environment based on measuring time-of-arrival (TOA) from the cooperative sensing.First derive an optimized recursive Bayesian solution by adopting a multiple model sampling-based importance resampling particle filter for the development of CSN. It can accommodate nonlinear signal model and non-Gaussian po- sition movement under different levels of channel knowledge. It also utilize a Rao-Black wellization particle filter to split the original problem by tracking the channel condition with a grid-based filter and estimating the position with a particle filter. The CSN with position and channel tracking exhibits advantage over the non cooperative methods by utilizing ad- ditional cooperative measurements. It also shows improvement over the methods without channel tracking.

MERITS:

Simulation results validate that both schemes can take the advantage of cooperative sensing and channel condition tracking in mixed LOS/NLOS environments.

DEMERITS:

Nonlinear signal model and non-Gaussian position move- ment under different levels of channel knowledge.

II. PROBLEM STATEMENT

Indoor navigation on mobile devices, existing system been carried out in the past decades, such as using wireless sensor network fingerprints, geomagnetic fingerprints, inertial measurement unit, and Google Glass device camera.

Computer vision software (such as visual odometry) and hardware (such as graphics processing units) in recent years have provided the potential capabilities for vision based real- time indoor simultaneous localization and mapping (SLAM).

DISADVANTAGES

- The inaccessibility of indoor positioning,
- The immature spatial-temporal modeling approaches for indoor maps, the lack of low-cost and efficient obstacle avoidance and path planning solutions, and
- The high complexity of a holistic system device for blind user.

III. RFID INDOOR MAP

A real-time holistic mobile solution for blind navigation and way finding and achieved greater success than previous efforts. Then developed the RFID indoor map to parse geometric information and extract the semantic map with a global 2D traversable grid map layer and context-aware layers which enabled the global path planning to desired destinations.

An efficient obstacle detection is presented and avoidance method that not only augments navigation safety but also adjusts the path in real-time.

The Smart Cane is designed for robust HMI which mitigates the problems caused by non-perfect voice recognition soft- ware, such as malfunctions in noisy environments or command misunderstanding from users.

ADVANTAGES

• The low complexity and high localization accuracy of a holistic system device for blind user.

• Low cost and High efficient time-stamped map Kalman filter algorithm used to detect obstacle.

A. ARCHITECTURE DIAGRAM

In the block system the ultrasonic range finder is used. Get data from range finder by three techniques. They are Serial, Analog and Pulse width modulation technique. The distance is measured according to the analog value derived from the sensor. It gives poor result and it deviates much from the actual one so pulse width modulation technique is applied here. According to this method per cm sensor generates 58 pulses and per inch 147 pulses. And its accuracy is good enough to measure accurate distance. It used the Arduino NANO board for implementing our project. The board contains ATmega 328p microcontroller that operates these sensors and processes the filter operation of the achieved distance by the sonar's and sends it to the android application via Bluetooth module. Three vibrating motors are connected with the board too.

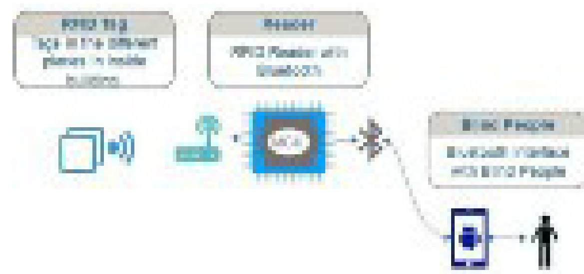


Fig. 1. Architecture diagram

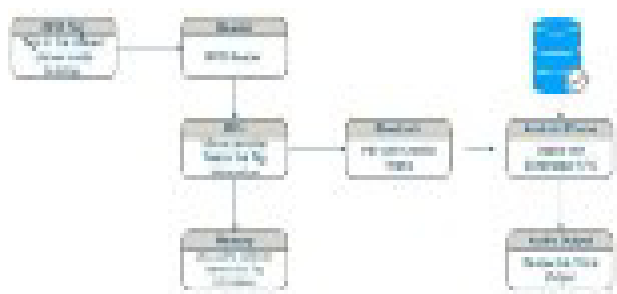


Fig. 2. Detailed Architecture

IV. IMPLEMENTATION

The effectiveness of the localization infrastructure has been experimentally evaluated for localization and tracking of a person that is moving in a hospital. It is a good scenario for testing the localization infrastructure being a highly scattering environment with general ward, emergency ward and recep- tion. The experimental setup (at 127KHz) consists of a reader with a commercial beam width about 67°, maximum gain 6dB and circular polarization. Ad-hoc designed tags with beam width about 50° and maximum gain 10dB are deployed on the side wall (3cm in height) to form a square mesh having side 1.2 m long. A schema of a portion of this location is reported where both location and tags positions (small white squares) are shown. The reader's antenna is kept at about 2cm from the floor by the hands of a person that walks along a prearranged route. The power radiated by the reader is 50mW. The path followed by the person has been marked on the floor and the coordinates of each point where the IDs of the responding tags are recorded have been determined. These points are shown by means of the circle markers of the continuous line, which is the actual path. The path estimated by the localization algorithm. The distance between the actual and the estimated position is considered as the error of the localization algorithm. Also the information sends to the mobile APK via Bluetooth communication and the data converted by speech output.

A. GEOMETRIC INFORMATION FROM ARCHITECTURAL MODELS

This user model included various information about physical capabilities, access rights, and user preference modeling. The system used a hybrid model of the indoor map representation which combines symbolic graph-based models and geometric models.

A vector field histogram (VHF) to provide effective sonar- based obstacle detection and avoidance. VFH used sonar readings to update a local map with detected obstacle in the form of uncertainty grids, which was used to calculate a polar histogram to represent the geometric information of the obstacles.

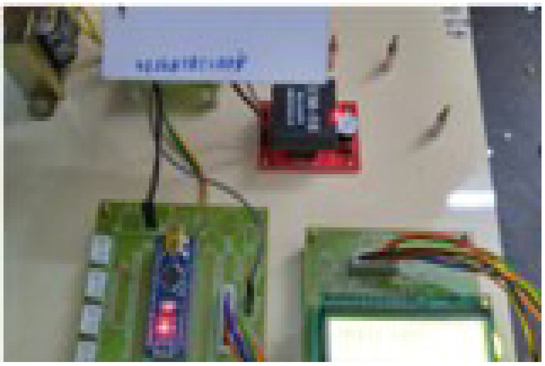
B. SEMANTIC MAP CONSTRUCTION

We automated the default location map generation process by developing an indoor map RFID tag placement model of architectural floor map, which was provided by the Campus Management department. The map contains file using path status, and extracts the geometric entities of the floor's model, including line entities, text entities, floor entities, and empty land entities

Further, our indoor map editor recognizes the regions of hallways, the topologies between room labels and correspond- ing doors, the global traversable grid map layer, room area and labels, door locations. In addition, the map editor is able to edit RFID (add or delete) any tag information, such as connectors (e.g. elevator banks and stairs) between floors to support multi- floortransitions. All of this spatial context-aware information is referred to as the semantic map to support assistive navigation and location awareness purposes

C. RFID BASED TRACKED INFRASTRUCTURE

Low vision or outwardly disabled individuals face issues in recognizing objects. The deterrent ID subalgorithm distinguishes objects utilizing a RFID peruser put on the keen stick. It is utilized to distinguish objects by utilizing the RFID labels that are appended to them. The articles are distinguished by a RFID peruser which peruses the data put away in the RFID labels connected to the items. The data put away in the RFID labels incorporates the names of articles, for example, couches, seats, and tables. Likewise arranged the RFID labels to store the shade of dress, for example, shirts and jeans. The RFID labels are then joined to the apparel, which enables the client to recognize the shading and sort of their garments and as needs be pick which shading garments to wear. After perusing the data related with the article, it is passed on to the client as sound input.



The sort of RFID labels is chosen upon the utilization. For the model, select the LF RFID labels since the radio sign enters the square better. The labels can be introduced along the pathway or if nothing else at the intersection of the trail inside the structure. The label stores the label ID, and the label area. To decrease the monstrous measure of area data for clients, the area can be progressively partitioned; For instance, each label area is distinguished by an area zone, a way, a connection, and a hub in term of scope and longitude.

Fig. 3. Working with RFID TAG IN THE PROTOTYPE

D. *OBSTACLE DETECTION AND AVOIDANCE*

Route ability and safe travel are basic for indoor assistive route frameworks. Continuous snag evasion is a specific test for self-sufficient mechanical frameworks. Re-searchers have investigated different snag shirking techniques for independent route.

The snag discovery calculation accumulates the data from the sensors that are put at various levels. The data accumulated utilizing the sensors is organized by the deterrent TSKF discovery calculation dependent on the separation of the impediment. Obstructions up to hundred cm are identified. At the point when an obstruction is recognized, the degree of the impediment and the good ways from the keen stick client are passed on to the client with suitable sound input.

E. *TIME STAMPED KALMAN FILTER ALGORITHM*

The calculation works in two sections—one section is for impediment discovery ID and the other part is for route and limitation. The calculation assembles data from the earth by utilizing RFID and range-based sensors. The assembled data is organized, and the client is given criticism likewise.

The hindrance discovery part of the calculation utilizes ultrasonic sensors and a wet sensor put on the savvy stick. The deterrents in front are recognized when the keen stick is held straight ahead by the client. The direction edge of the savvy stick is determined utilizing an accelerometer. In the event that the brilliant stick is inclined either in the x-hub or the y-pivot, the client is incited to hold the stick straight by means of a sound criticism. The foot, knee, midriff, and chest-level obstructions and chest-levelcaffolds are distinguished by an impediment discovery calculation. On the identification of hindrances in the route way, material and sound criticism is given to the client.

ALGORITHM

Input: id: RFID indoor
map value s: Sensor value
Output:
NL: semantic topology graph, navigation and localization obJ: obstacle detection/identification
1: procedure rfid tag location (l) and object detection (obj)
2: l ← tag(tag no.) as WHITE
3: for each tag in l then in memory tag do
4: find tag num and location

5: bt ← send via bluetooth
6: while (l! = empty) do
7: no$_t$ag, notagdata(nothingtodo)
8: for v in neighbor of(m) do
9: update tag data
10: if tag no(is equal) ¿location updating 11: [x,y] ← next area navigation
12: else if current location then
13: check sensors data ← empty
14: for sensors ultrasonic and ir sensor do
15: if (sensor data) ¿ high then
16: update to blind user
17: L(w,h) ← label
18: else
19: add it in controller
20: for senor in data do. get result
21: obj ← detection
22: return (id, s)

F. *SENSOR INFORMATION*

The sensors mounted in the spectacle detect the objects in the left and right side of the blind person and the sensor mounted in the finger detects the object situated on the ground.Ultrasonic and IR sensors, range finders are used to detect the position of the obstacle and to measure the distance between the sensor and the object.

The sensors are arranged on the smart cane considering the average height of an adult human as per the standards. Obstacles at foot, knee, waist, and chest level as well as chest- level scaffolds and ascending staircases are detected using sensors S1, S2 and S3. Sensor is used to detect ascending and descending staircases.

Fig. 4. LOCATION 1 REACHED AND DATA SEND TO MOBILE APPLI- CATION

Fig. 5. LOCATION 1 AWAY (OUT) AND DATA SEND TO MOBILE APPLICATION

V.CONCLUSION

In this project, to implemented a system for blind naviga- tion. The final result of our approach is a blind navigation and tracking system with a flexible architecture that can be adopted in blind mobility. The system has been tested through several test cases. The blind assistive device with Eye mate for Blind android application is very useful for a blind person to move without the help of other and the user can seek emergency help through voice call. The tracking system involved here through Blind Tracker application is very applicable to track the current location of the blind person.

A. FUTURE WORK

Future research directions will focus on cognitive under- standing and navigation in more complex and cluttered en- vironments, such as transportation terminals. Also the Tag details were store and get the location information through database for improved localization efficiency for indoor and outdoor applications.

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