

Article

A Walking GPS Stick for Visually Disabled Folks-A Review

Gawad Kaushik¹, Gadala Ana²

^{1,2}Affiliated to Mumbai University, Thakur Institute of Management Studies, Career Development and Research, Mumbai, Maharashtra, India.

I N F O

Corresponding Author:

Gawad Kaushik, Affiliated to Mumbai University Thakur Institute Of Management Studies , Career Development and Research. Mumbai, Maharashtra.

E-mail Id:

kaushikgawad99@gmail.com

How to cite this article:

Kaushik G, Ana G. A Walking GPS Stick for Visually Disabled Folks-A Review. *J Adv Res Comp Graph Multim Tech* 2020; 2(1): 11-16.

Date of Submission: 2020-02-14

Date of Acceptance: 2020-03-14

A B S T R A C T

A walking-stick for helping a visually disabled user is on condition that. It consists of an extended covering taking a lever at one finish and a distal finish conflicting the handle. At the distal finish of the housing a wheel is fixed. The wheel being equestrian to the housing by a Swivel base permitting the wheel to Swivel in any way in reply to the user moving the walking aid. The extent of the covering is selected stated by the user will well hold the grip of the walking aid however walking with the wheel which is subsidiary the housing by progressing on the bottommost. The housing comprises a telephone that is joined to earpiece and electro-acoustic transducer boundary worn by the user. The earphone/microphone interface authorizations the user to effort the mobile phone expedient to procedure and receive telephone calls. A GPS unit is limited within the housing. The GPS unit comprises a voice interface that is prepared to obtain a plurality of book of directions as Voice commands. The voice interface is any systematized to transmit GPS info, like location, way of travel, speed and directions as Voice messages. The earpiece and electro-acoustic transducer boundary are prearranged to couple to the GPS unit stated the user will spread voice commands to the GPS unit finished the electro- acoustic transducer and consequently the GPS unit will transmit the Voice messages to the user finished the earpiece.

Keywords: Walking-Stick, Visually Disabled, Walking Aid, GPS

Introduction

The present invention may be a walking aid for helping a visually disabled user that overcomes the disadvantage of the previous art. The walking aid consists of associate elongated housing having a handle at one finish and a distal finish opposite the handle. A wheel is mounted to the distal finish of the housing, the wheel being mounted to the housing by a Swivel mount allowing the wheel to Swivel in any of the direction and in response to the user's movement. Swivel is a basically joining two parts which enables one to revolve without turning the opposite.¹ The

length of the housing is chosen specified the user^[2] will well hold the handle of the walking aid whereas walking with the wheel which is supporting the housing by rolling on the bottom. The housing contains a telephone that is coupled to earpiece and electro-acoustic transducer interface worn by the user. The earphone/microphone interface permits the user to work the mobile phone device to form and receive telephone calls. The housing contains a cellular phone that is coupled to associate headphone and mike interface worn by the user.^[3-8] The earphone entomb face permits the user to control the cellular phone device to create and receive telephone calls. A GPS unit is contained

within the housing. The GPS unit encompasses a voice interface that is designed to receive a plurality of manual as Voice commands. The voice interface is more designed to transmit GPS data, like location, direction of travel, speed and directions as voice messages. The headphone and mike interface are designed to couple to the GPS unit specified the user will transmit voice commands to the GPS unit through the mike and also the GPS unit will transmit the Voice messages to the user through the headphone.^[9-15]

As stated earlier, the wheel conjointly makes the device easier to hold since the wheel is supporting the device on the bottom. The GPS unit, cell phone, electronic sensors, and wheel act synergistically to produce the user with a Superior direction aid. The electronic sensors and wheel give the user with short vary direction data that helps the user avoid immediate and comparatively short vary obstacles, thereby providing the user with enlarged sense of security as a result of he/she is a smaller amount seemingly to stumble, fall or impinge on pedestrians or alternative objects. The GPS unit provides the user with longer vary direction data additional as directional data. Since the electronic sensors and GPS unit square measure each coupled to the mix earpiece interface, the user will receive warnings regarding short vary obstacles whereas paying attention to direction data.^[16-23] This might not be as simply achieved if these devices square measure provided individually. Since the telephone is likewise coupled to the earphone/microphone interface, the user may also interact in a very cell spoken communication whereas receiving each GPS data and warnings from the electronic obstacle detectors. Again, it'd be troublesome for the user to work all 3 devices at the same time if these devices were provided individually.

Shaft is supplied with clips for mounting a typical folding walking Stick. Panels area unit on condition that on shaft to supply wattage to the assorted parts of the equipment, as shall be additional utterly delineate later. Strap is additionally provided on shaft to create the help easier to hold. Preferably, shaft is created of extruded metal or another durable by light-weight material like plastic. Shaft homes variety of helpful devices that add synergistically to the quality of the walking aid, as an example, hand portion contains a inbuilt mobile phone that is self-enclosed in a very waterproof compartment settled adjacent the handle. Buttons area unit positioned on handle to alter the user to quickly and simply access the mobile phone once needed. GPS unit is additionally provided in a very water proof compartment contained at intervals shaft/housing. The GPS unit is ideally coupled to associate emergency communication associated navigation system just like those used with the ON begin system to allow the user to receive not solely position data however additionally to transmit

data to a foreign center within the event of an emergency. As shall additional notably be explained below, GPS unit contains a voice entomb face that is designed to receive book of instructions as Voice commands and to transmit GPS data, like location, track of travel, speed and directions as Voice messages. Mobile-phone may additionally have a radio feature, or instead, a separate satellite radio is also engineered into a water tight compartment in shaft. cell and GPS unit (along with any radio device) area unit operatively coupled to speaker in order that the user will hear either the mobile phone voice communication or Volume, tuner and on/off switches area unit positioned adjacent handle to create them pronto accessible to the user.

AIM/OBJECTIVE The objective of this paper is:

- To provide walking assistance to the visually disabled people.
- The present invention provides a really convenient aid to visually impaired or unseeing individuals. By incorporating a telephone device with a GPS unit, the electronic eye and a wireless headphone, the user will feel safer that he or she has all that they have so as to travel regarding their day with safety and confidence just by taking the walking aid. The device delivers the user with direction data allowing the user to understand within which direction to travel, whether or not or not he/she is traveling within the right direction, once to show right or left, and once the specified destination has been reached. By receiving this GPS data as voice messages through the earpiece worn by the user, the user is healthier able to clearly receive and comprehend the GPS data in a very uproarious town street. within the event of emergency, of if the user becomes disoriented, lost or confused, the user will merely interact the cell to form a telephone or log onto the emergency direction help system to receive aid from a foreign operator.
- According to Shrivastava, K., Verma, A. and Singh, S. P., it is stated that the distance measurement between the object within the path of an individual, equipment, or a vehicle, stationary or moving and the individual is employed during a sizable amount of applications like robotic undertaking control, vehicle control, blind man's walking-stick, medical applications, etc.^[3]. Thus, this device conjointly provides the user with immediate direction data like once the obstacle is being approached. The wheel being mounted to the front of the device provides the user with second by second tactile data regarding the condition of the walk right away ahead. If a pot hole or crack within the pavement square measure gift before of the device, the wheel can bump on the outlet or crack, thereby warning the user to require immediate precautions to avoid staggering.

Literature Review

Itinerant independently is not easy for people who have no eyesight.⁴ Being unable to examine, it's tough for visually disabled individuals to soundly cross Streets, enter and exit buildings, or maybe walk down a crowded street.⁵ Most visually reduced those area unit typically intimidated by the many hazards Associate in Nursing obstacles which might interfere with the safe navigation of an metropolis as an example, crossing associate in Nursing intersection displaying a green-light may be a trivial matter for a seeing person, except for somebody littered with impairment it's a frightening challenge. Firstly, there's sometimes no manner a visually impaired person will decipher if the intersection lightweight is inexperienced or not. Then, it's typically tough for the visually decreased person to find the precise location of the road curb so he/she doesn't stumble and to position themselves properly so they there is additionally the 54000 dollars worry that the visually impaired person could stumble upon another pedestrian, uncover a pot hole or accidentally walk into oncoming traffic. The ultrasonic stick does not work most of the time and hence it is not feasible to use. As a result, most of the people who are suffering severe impairment sit up for a seeing person to help them in crossing the road. Even walking down the road to a store are often quite tough for a unseeing person as a result of it is nearly not possible to keep up the right orientation whereas walking to make sure that one doesn't walk off the walkway. With this to foot traffic, urban streets area unit typically dotted with obstacles like post boxes, garbage cans, signs, poles and therefore the like; Potholes, cracks within the pavement and street curbs area unit different obstacles that a person who can't see has to try and avoid whereas walking. Since it's nigh not possible to scan street signs or different location clues while not a minimum of some vision, it's additionally quite straightforward for a visually impaired person to become lost and disoriented once walking even a brief distance. As a result, visually impaired individuals have a bent to refrain from traveling outside the house.

Varieties of aids are introduced to do to increase the quality of visually impaired folks.^{6,7,8} The white cane was presented decades to provide some level of sensory input for a blind (or visually impaired) person. With the cane, someone will avoid walking into objects like walls or post boxes and should even be ready to "feel" the situation of street curves; whereas useful, canes have restricted relevancy.

Firstly, they're usually unable to sense pot holes or little obstructions within the pavement ahead; they will not be wont to properly orient a private to confirm that the individual walks within the right direction and that they cannot warn against any obstruction that is quite a meters away.

Methodology

The aim of this paper is to help the visually disabled folks hence, it is significant to know about the blindness and its levels.^{4,9}

It was found and noted that there are 3 major difficulties which are faced by visually disabled folks[10] as follows:

The Necessity to lift others for Facilitate

All visually disabled people usually quit on a routine for various reasons like enjoying personal activities, shopping, and dealing. In terms of asking others for facilitate, some believe getting facilitate from strangers isn't fascinating, and therefore asked a private sort of a lover or love to guide them; the majority of participants were unhappy asking others to guide them, "Because visually healthy people may not believe that we tend to tend to stand live visually impaired or blind, and this may not go well".

Issues in Distinctive Routes and Exploitation of GPS

Visually disabled people have utterly totally different strategies in distinctive routes like keeping count of the spaces they approved, presence of stairs, shops, signs on all-time low like very little stationary obstructions, types of piece of ground, bus stations, curb stones, overpasses, slopes, declivities, gas stations, recognizing bumps and numeration them exploitation their memory, buildings, signs of underground stations, hearing and smelling clues from the atmosphere, and getting facilitate from others. Some participants expressed that they'll maneuver streets higher within the dead of night as results of they'll merely acknowledge vehicle lights. They put together said that "recognizing underground signs within the dead of night is easier than throughout the day as a results of they have their lights on." exploitation escalators area unit problematic in line with some members as a results of it is not constantly clear whether or not or not it's moving up or down.

The majorities of visually disabled people use GPS technology and have little information relating to it. Many people had GPS programs on their mobile phones. They believed this was useful once traveling by automobile notably once taxies do not provide such facilities. This technology helps drivers notice the destination.

Potential Risks for Accidents

Nearly all participants had toughened accidents as results of their vision. It got to be noted that motorbikes and bicycles would possibly ride on footpaths and sidewalks in some areas. For this reason, many individuals with vision defect have toughened accidents with these vehicles. Bike-drivers put together manufacture many dangerous things for everyone by not following traffic rules. Overall the different causes of accidents were falling from stairs, falling into holes, bumping into objects in footpaths, falling

onto underground rails, falling into gaps between buses and the ground or bumping into doors of glass. There can be canals may not be coated, and therefore is additionally attainable risk for falling and fracture. Some participants had toughened fractures owing to falling into these canals. One of the oddest problems inflicting accidents is aerial obstacles. numerous findings were found that explicit that transportation of instruments furthermore as water pipes, and alternative completely different objects on the roofs of vehicles is not uncommon in some areas. there's one or 2 m of these materials protruding from the tip of a vehicle at relating to 1–1.5 m height from all-time low. Typically, these vehicles park throughout a method throughout that the tip of a bar would be positioned on sidewalks, inflicting head injuries; it is nearly common, and many visually disabled folks have extremely encountered these types of accidents. Another possible offer of aerial accidents is that the existence of tree branches among the sidewalks.

The below pie chart gives the approximate data of hindrance that are encountered on the street.

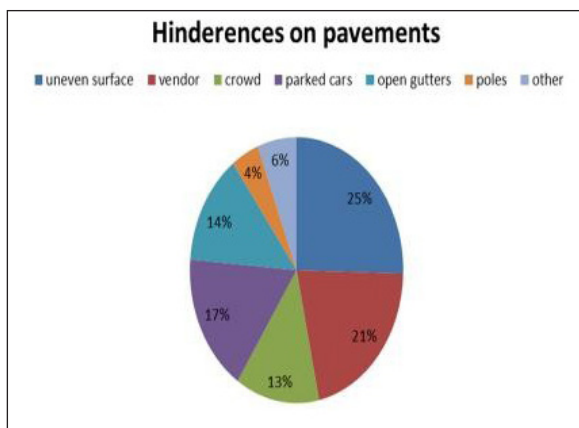


Figure 1. Hinderences on pavements

There are many investigations available for the walking sticks enabled by various techniques^{11,12} and also on wheelchairs^[13] which are enabled with GPS which helped in knowing the current state of inventions and to couple the features of them in order to reduce the errors. Various surveys^[15] were taken into consideration in order to know the state of the visually disabled folks. This helped in finding out a usable and compatible solution for these folks.

By noting the analysis of Kang, Sung Jae, Young Ho, Kim and Moon,¹⁶ we were able to resolve what elements were needed for this walking stick. A navigation aid for helping a disabled user comprising a housing, a cellular phone contained inside the housing, associate degree electro-acoustic transducer and mike interface organized to be wearable by the user, the electro-acoustic transducer and mike interface organized to couple to the wireless telephone to allow the user to control the cellular phone through the electro-acoustic transducer and mike interface, a GPS

unit contained inside the housing, the GPS unit having, a voice interface organized to receive a plurality of book of instructions as voice commands from the user and for transmission GPS info to the user as Voice messages, the electro-acoustic transducer and mike interface organized to couple to the GPS unit specified the user transmits the and Voice messages to the GPS unit and to receive the GPS info from the GPS unit are going to be needed to produce optimum level satisfaction to the visually disabled folks^[24-26]

Result and Disscussion

A walking aid for helping a visually disabled user comprising an:

- Extended housing having a handle at one finish associated a distal finish opposite the handle,
- A wheel mounted to the distal finish of the housing; the wheel being mounted to the housing by a Swivel mounts allowing the wheel to swivel in any direction
- the housing having a length elite specified the user will well hold the handle of the walking aid whereas walking with the wheel Supporting the housing. This is then coupled to manage module sixty that contains associate semiconductor diode driver and a proof multiplier factor.

Drive is designed to drive LED to project associate IR signal and signal multiplier factor is designed to watch infrared detector for the IR signal mirrored back towards detector. Management module is designed to live the measure between once associate IR signal is projected from semiconductor diode and once the mirrored IR signal is detected by detector. management module is any designed to get associate alarm signal once the measure between projected and mirrored IR signals falls below a pre-determined interval, indicating that associate object could be a preselected distance ahead of detector. Management module is coupled to wireless interface; that is successively wirelessly coupled to phone interface.

The management module associated wireless interface area unit designed specified once management module generates an alarm signal, the alarm signal is broadcast by wireless interface and picked up by interface.

A specific embodiment of this stick has been disclosed; but, many variations of the disclosed embodiment may be pictured as among the scope of this invention. it's to be understood that this invention isn't restricted to the embodiments represented on top of, however encompasses any and every one embodiment among the scope of the subsequent claims.

It will be appreciated that the current invention will also be employed in a lot of compact kind together with a wheelchair to supply aid and help to a disabled person who may, or may not, be blind. In such a case, the device

would not have Associate in Nursing elongated housing however rather a compact housing containing the GPS unit, blue tooth unit, cell phone and management module.

Conclusion

The GPS unit, cell phone, electronic sensors, and wheel act synergistically to produce the user with a Superior guidance aid. The electronic sensors and wheel give the user with short vary guidance data that helps the user avoid immediate and comparatively short vary obstacles, thereby providing the user with Associate in enhancement of the nursing sense of security as a result of he/ she is a smaller amount probably to stumble, fall or hit pedestrians or alternative objects. The GPS unit provides the user with longer vary guidance data still as directional data. Since the electronic sensors and GPS unit are each coupled to the mixture earphone/microphone interface, the user will receive warnings regarding short vary obstacles whereas being attentive to guidance data; this may not be as simply achieved if these devices are provided one by one. Since the cell is likewise coupled to the earphone/ microphone interface, the user also can interact in a very cell spoken language whereas receiving each GPS data and warnings from; again, it might be tough for the user to work all 3 devices at the same time if these devices were provided one by one.

The device is additionally given facet viewing obstacle detection sensors, ideally optical sensors, that area unit tailored and designed to warn of any obstacles situated on the edges of the device. Obstacle detection devices which have well identical style like electronic sensor are used. Electronic sensors are capable of relaying basic info to the user regarding such things as lightweight density or day/ night standing. Optical device is capable of sleuthing so, fast changes in elevation ahead of the device. Temperature sensors may be coupled to those optical sensors to produce the user with Associated to the nursing sounding signal signifying the close air temperature. Optical device may be designed to incorporate picture devices to sense a selected frequency of sunshine like an inexperienced or red stoplight such the device can send a distinct sign to manage module once the sensor detects either an inexperienced or red stoplight. management module is also designed to send a distinct sounding alarm counting on whether or not device measures a red or inexperienced stoplight or picture sensors (detectors) that area unit sufficiently specific and sensitive to sight wavelengths of sunshine like inexperienced and red traffic lights area unit out there within the market.

References

1. Definition of swivel, <https://en.wiktionary.org/wiki/swivel>
2. Nicholas, Allan 1995. Why Use the long Cane. 1st Edition. s.l. : Dexter,.
3. Shrivastava K, Verma A, Singh SP. Distance Measurement of an Object or Obstacle by Ultrasound Sensors using P89C51RD2. *International Journal of Computer Theory and Engineering* 2010; 2.
4. Ardit A, Rosenthal B. Developing an Objective Definition of Visual Impairment. *Proceedings of the International Low Vision*. 1998; 331-334.
5. Research on problems of blind pedestrians, http://www.apsguide.org/appendix_c_research.cfm
6. Virtual Walking Stick for the Visually Impaired. [Online] 2010. <http://contest.techbriefs.com/2012/entries/medical/2746>.
7. Omolayo A Design and Construction of a Multidimensional Sensor Blind Man Stick. Electrical and Electronic Engineering, University of Ibadan.. B.Sc Project 2011.
8. Blind walking Stick Project, <https://nevonprojects.com/ultrasonic-blind-walking-stick-project/>
9. Paul S. Duckett & Rebekah Pratt, The Researched Opinions on Research: Visually impaired people and visual impairment research, <https://www.tandfonline.com/doi/abs/10.1080/09687590120083976?journalCode=cdso20>
10. Problems faced by blind people <https://wecapable.com/problems-faced-by-blind-people/>
11. Wahab, Mohd Helmy Abd et al. Smart Cane: Assistive Cane for Visually-impaired People. *IJCSI International Journal of Computer Science Issues* 2011; 8.
12. Srirama D. Ultrasonic and voice-based walking stick for the blind. Department of Electronics and Communication Engineering, Gokaraju Rangaraju Institute of Engineering and Technology 2010.
13. Kim EY, Wheelchair Navigation System for Disabled and Elderly People, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5134465/>
14. Dakopoulos D, Bourbakis NG. Wearable obstacle avoidance electronic travel aids for blind: a survey," Systems, Man, and Cybernetics, Part C: Applications and Reviews, *IEEE Transactions on* 2010; 40. Bruno, Pollet. (2012). Power Ultrasound in Electrochemistry: From Versatile Laboratory Tool to Engineering Solution.: John Wiley Sons, 2 ISBN1119967864.
15. Corso J. Bone-Conduction Thresholds for Sonic and Ultrasonic Frequencies., *Journal of the Acoustical Society of America* 1963; 35.
16. Jae KS, Ho Y, Kim. Moon, In Hyuk Development of a mechatronic blind stick. Seoul, Korea: s.n., 2001. Proceedings of the 2001 IEEE International Conference on Robotics & Automation. 2001; 3209-3213.
17. Shruti D, Sakhare A. Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS. 2nd National Conference on Information and

- Communication Technology (NCICT). 2011; 31-33.
18. Robert N. Squire's Fundamentals of Radiology. 5th Edition. s.l. : Harvard University Press 1997; 34-35. ISBN0-674-83339-2.
 19. Takeda S, et al. Age Variation in the Upper Limit of Hearing., European Journal of Applied Physiology, 1992; 65.
 20. Popper A, Richard R, Fay. Hearing by Bats Handbook of Auditory Research.: *Springer* 1995.
 21. Larry B. Low Vision Education and Training: Defining the Boundaries of Low Vision Patients. A Personal Guide to the VA Visual Impairment Services Program 2006.
 22. Srirama D et al. Ultrasonic And Voice Based Walking Stick for the Blind. Gokaraju Rangaraju Institute Of Engineering And Technology. 2010.
 23. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *British Journal of Ophthalmology*, 2011.
 24. Quigley M, Conley K, Gerkey B et al. ROS: an open-source Robot Operating System. in Int. Conf. on Robotics & Automation, 2009.
 25. Sight City, <http://www.sightcity.net/en/>, 2014.
 26. Cosgun A, Sisbot EA, Christensen HI. Guidance for human navigation using a vibro-tactile belt interface and robot-like motion planning," in Int. Conf. on Robotics & Automation, 2014.
-