VOICE ALERT BASED SMART BLIND STICK

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ABSTRACT

It's unsafe for visually challenged persons to cross the street since they have trouble recognizing the objects in front of them. The smart stick is a tool for defining their environment. In this study, we suggest a solution, shown by a smart stick equipped with an infrared sensor to identify stairs and two ultrasonic sensors to identify any other obstructions within four meters of the user. In order to avoid puddles, another sensor was added to the bottom of the stick. The spoken warning message starts when an obstruction is detected. There are roughly 285 billion visually impaired people and about 39 million people who are permanently blind. A blind individual who uses a cane struggles to complete his own work. There is perpetual worry about becoming hurt or getting into an accident. How can we deal with those issues? We have, in fact, offered a solution that will help the blind with this issue. Which one is "blind stand with voice control to guide blind people" this device basically alerts and informs the blind person of the dangers using an arduino uno, an ultrasonic sensor, and a voice module. A blind person will be able to walk more easily and safely.

Keywords: Blind, Intelligent Walking Stick, Physically Impaired, Ultrasonic Sensor, ISD 1820, Arduino UNO

INTRODUCTION

Visual impairment can significantly affect a person's independence and safety when navigating through their environment. Traditional white canes have been invaluable tools for the blind, helping them detect obstacles and terrain changes. However, with advancements in technology, there is an opportunity to enhance the mobility and safety of visually impaired individuals. The "AI and IoT-Based Voice Alert Smart Stick" is a groundbreaking solution designed to address the unique needs of the blind and visually impaired community.

This innovative smart stick leverages the power of Artificial Intelligence (AI) and the Internet of Things (IoT) to provide real-time assistance and information to individuals with visual impairments. It offers a comprehensive and adaptable system that combines data from various sensors and AI algorithms to help users navigate their surroundings with increased confidence and independence.

The smart stick employs ultrasonic or LiDAR sensors to detect obstacles and hazards in the user's path. When an obstacle is detected, the system provides audio feedback to alert the user, helping them navigate around it. Integrated GPS technology allows users to set their destination and receive turn-by-turn directions through voice

commands. The system helps guide users along their chosen route and provides information about nearby points of interest. The smart stick utilizes natural language processing and AI to deliver voice alerts, ensuring that users receive clear and comprehensible information. These voice alerts can be customized based on user preferences and requirements. The smart stick can connect to a mobile app or a central server using IoT technology. This enables remote monitoring and support for users, as well as the ability to receive updates and improvements over the air. The AI component of the system can identify and describe objects in the user's vicinity, such as signs, doors, or specific items, helping users understand their surroundings more completely.

The AI and IoT-Based Voice Alert Smart Stick is not only a tool for improved mobility but also a way to enhance the overall quality of life for blind individuals. With its comprehensive feature set and adaptability, it offers a significant step forward in promoting independence,.

LITERATURE SURVEY

Voice Assisted Blind Stick using Ultrasonic Sensor (2018), Priyanka Patil, Apurva More, Madhura Rakshe, Vaishnavi Badwe ,Rachana Patil ,Department of Computer Engineering, Pimpri Chinchwad Polytechnic, Nigdi, Pune, Maharashtra, India, This is application is for assisting blind and partially sighted people for smartphone use. It is equipped with a lot of predefined voice commands many activities can be performed including making calls, sending and receiving text messages, using the "phone book" with ease, determining the user's position, obtaining information about present time, and controlling the battery level. Full assistance for forgotten commands and charging connect or disconnect will be provided for blind peoples in this App. The Blind Stick of the blind user will also be included in the system. The blind stick will be equipped with sensors and will detect the obstacle in the user's path. It will calculate the distance of obstacle from user and convert it into footsteps. The user will be given a voice message that the obstacle is certain footstep ahead.

Voice Based Navigation System for Blind People Using Ultrasonic Sensor by Anushree Harsur and Chitra.M. Asst.prof. Bangalore, India June 2015, The main aim of this system is to permit blind persons to explore autonomously in the outside environment. Ordinary route navigational systems in the outdoor environment are expensive and its manufacturing is time consuming. Blind people are at extensive drawback as they regularly do not have the data which is required, while passing obstacles and dangers. They generally have little information about data such as land marks, heading and self velocity information that is crucial for them to explore them through new environment.

Ultrasonic and Voice Based Walking Stick for Blind People by D.Sekar, S.Sivakumar, P.Thiyagarajan, R. Premkumar, M. Vivek Kumar March 2016, This system presents a concept to provide a smart electronic aid for blind people. The system is intended to provide overall measures artificial vision and object detection, real time assistance via global positioning system (GPS). The aim of the overall system is to provide a low cost and efficient navigation aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of objects around them.

Design and Implementation of Smart Blind Stick, 2nd International Conference on Communication & Information Processing (ICCIP) 2020, Independence is the building methodology in achieving dreams, goals, and objectives in life. Visually impaired persons find themselves challenging to go out independently. There are millions of visually impaired or blind people in this world who are always in need of helping hands. For many years the white cane became a well-known attribute to blind person's navigation and later efforts have been made to improve the cane by adding remote sensors. Blind people have a big problem when they walk on the street or stairs using a white cane, but they have sharp haptic sensitivity. The electronic walking stick will help the blind person by providing a more convenient means of life. The main aim of this paper is to contribute our knowledge and services to the people of the blind and disable society.

SCOPE OF THE PROJECT

A voice alert-based smart blind stick has a wide scope for assisting visually impaired individuals. It could incorporate features such as obstacle detection, GPS navigation, voice commands, and emergency alerts. Additionally, integrating machine learning algorithms could enhance its capabilities over time.

METHODOLOGY

FLOW CHART:

A flow chart is a graphical representation of a process or system, typically using various shapes and arrows to illustrate the flow of information, materials, or activities within that process. It serves as a visual tool to depict the sequence of steps or decision points in a logical and organized manner.

The flow chart begins with a starting point and follows a series of interconnected symbols that represent actions, processes, or decisions. Arrows indicate the direction of flow, guiding the reader through the sequential order of events. Decision diamonds are often used to represent points where choices must be made, leading to different outcomes. Terminal symbols denote the end points of the process. Flow charts are widely employed in various fields such as business, engineering, and computer programming to convey complex procedures in a clear and understandable format, facilitating communication, analysis, and improvement of processes.

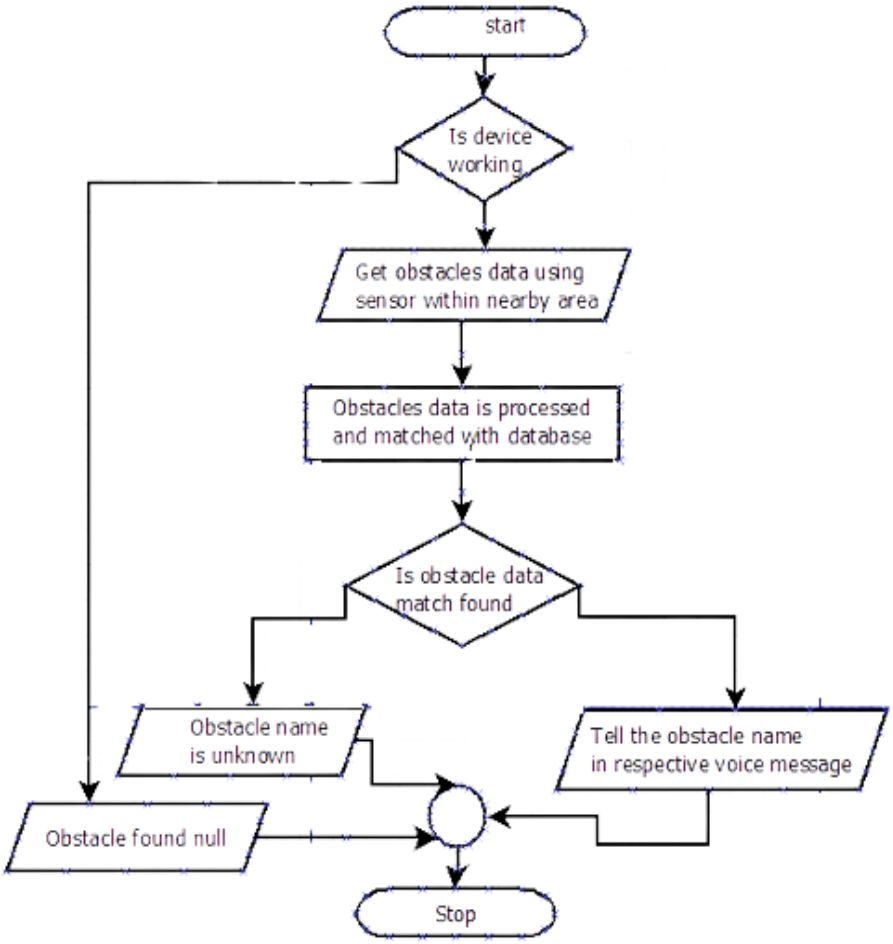

Fig 3 : flowchart

DFD Level 0:

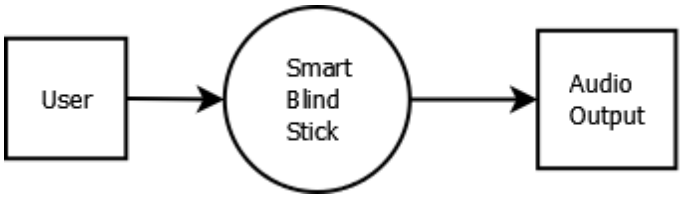

Fig 4 : DFD Level 0

A Data Flow Diagram (DFD) Level 0 provides a high-level overview of the system or process, focusing on the interactions between major entities. At this level, the diagram represents the entire system as a single process, often referred to as the "system boundary." The primary entities or external agents that interact with the system are depicted as external sources or sinks, and arrows indicate the flow of data between them and the system.In a paragraph, a DFD Level 0 typically describes the fundamental components of a system and their interactions without delving into the detailed sub-processes within each component. It serves as a visual abstraction, offering a top-level perspective to help stakeholders understand the overall flow of information and the key entities involved in the system.

DFD Level 1:

A Data Flow Diagram (DFD) Level 1 provides a more detailed view of the processes and data flows identified in the higher-level DFDs. At this level, the system is decomposed into sub processes, each representing a more granular view of the overall system functionality. These sub processes illustrate how data is transformed as it moves through the system, showing inputs, processes, and outputs.

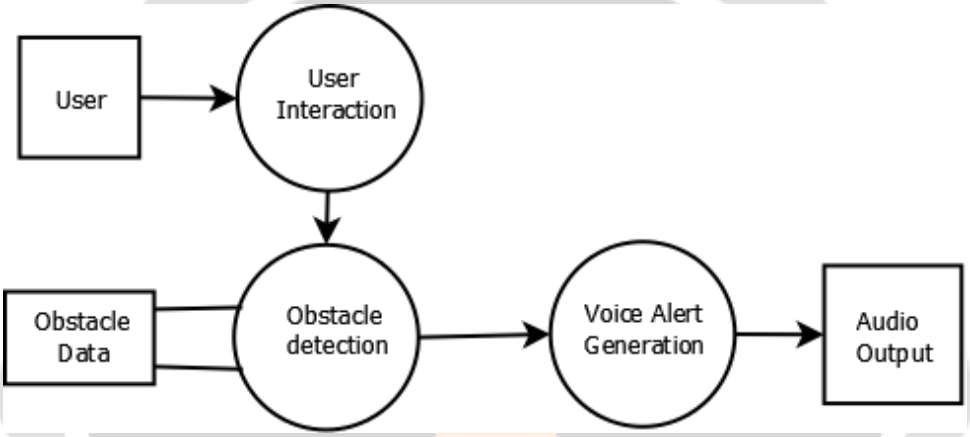

Fig 5 : DFD Level 1

The DFD Level 1 typically includes data stores, external entities, and data flows connecting the sub processes, offering a comprehensive depiction of the system's internal workings. This detailed representation aids in understanding the specific interactions and data exchanges that occur within each sub process, facilitating a more thorough analysis and design of the system.

Activity Diagram:

An activity diagram is a type of Unified Modeling Language (UML) diagram that visually represents the flow of activities within a system or a process. It provides a dynamic view of the system, focusing on the sequence of actions or tasks that occur and the transitions between them. In essence, an activity diagram helps to model the workflow or business processes, illustrating how different components or entities interact with each other over time.

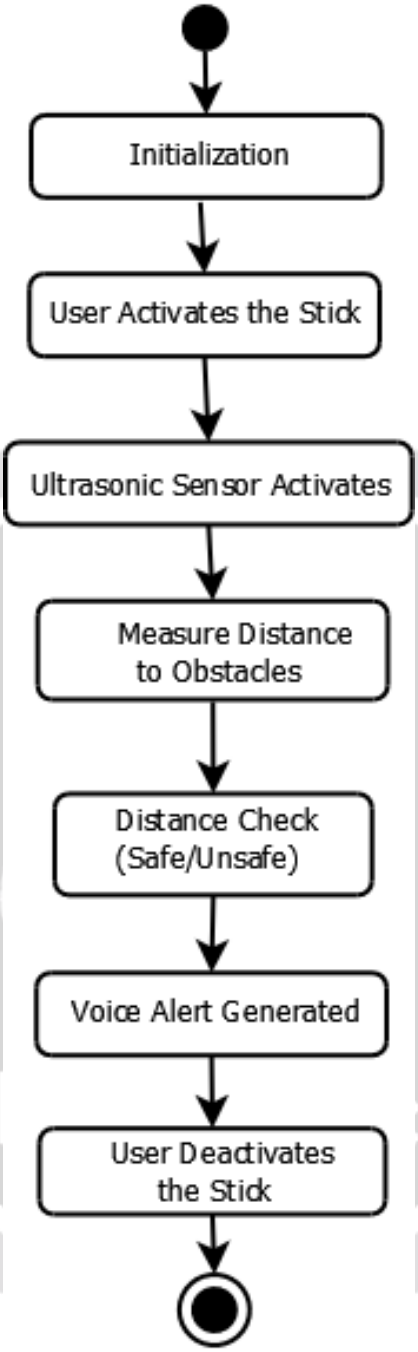

Fig 6 : Activity Diagram

Typically, an activity diagram consists of nodes and edges. Nodes represent activities or actions, and edges depict the transitions or flows between these activities. The diagram may also include decision points, forks, and joins to represent conditions and parallel activities. Each activity is usually annotated with a concise description of the action it represents.

Sequence Diagram:

A sequence diagram is a type of UML (Unified Modeling Language) diagram that illustrates the interactions and flow of messages between different components or objects in a system over time. It provides a dynamic view of the system, depicting the order in which interactions occur. In a sequence diagram, vertical lifelines represent the participants or objects involved, and horizontal arrows depict the messages exchanged between them.

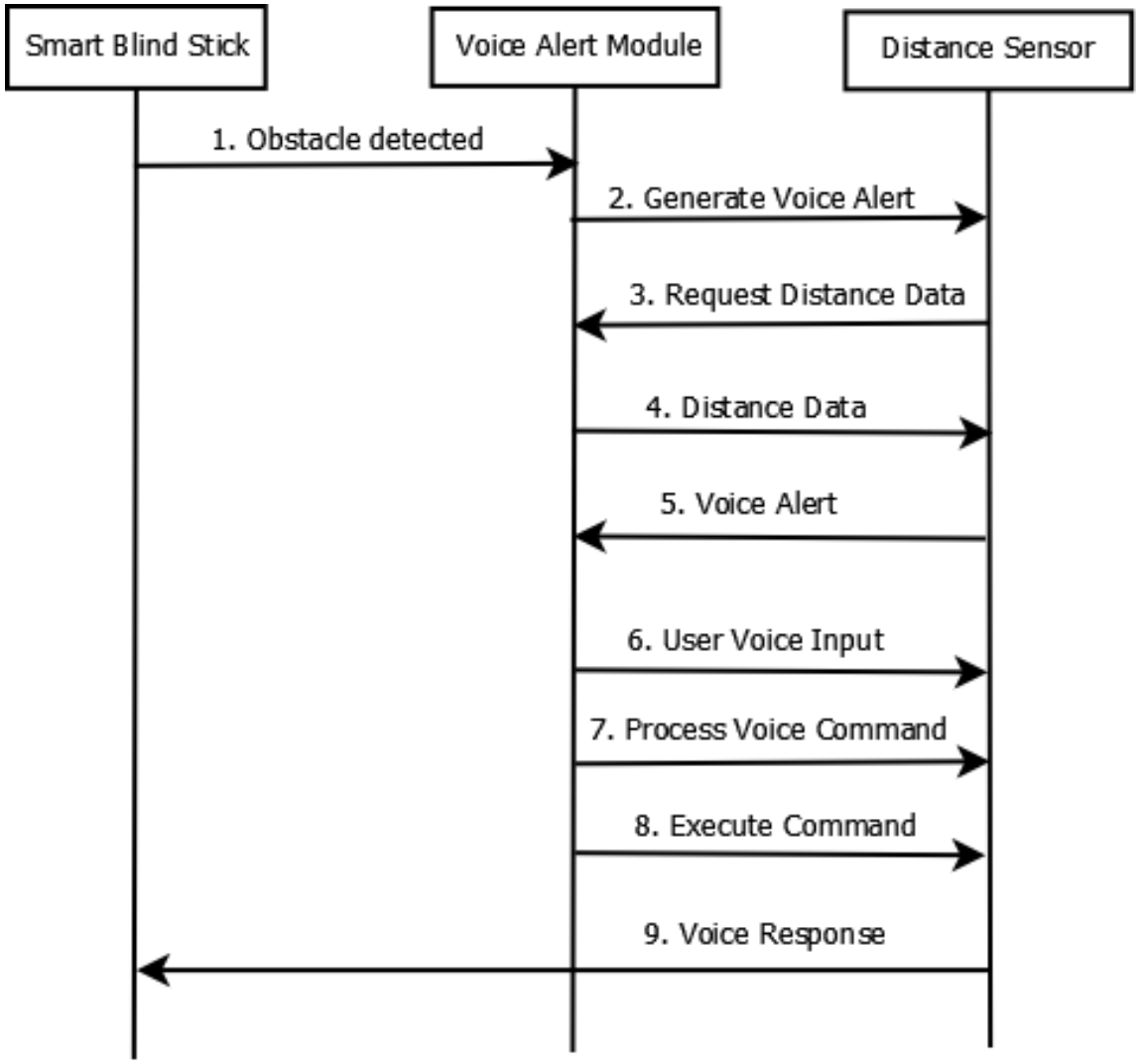

Fig 8 : Sequence Diagram

Use Case Diagram:

A use case diagram is a visual representation that depicts the interactions between a system and its external actors, typically users or other systems, to showcase the various ways the system can be utilized. It provides a high-level overview of the functionalities or services offered by the system from a user's perspective. In a use case diagram, actors are represented as stick figures, and use cases are depicted as ovals. Connecting lines between actors and use cases illustrate the relationships and interactions.

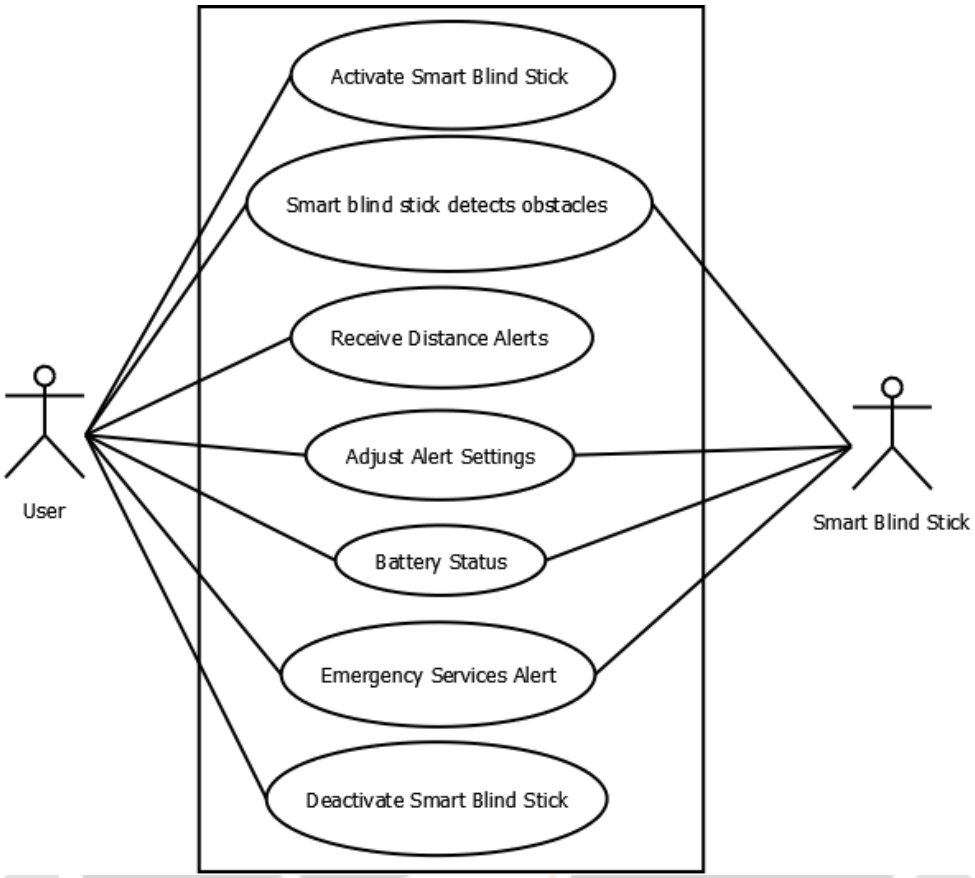

Fig 9 : Use Case Diagram

1.4 SOFTWARE REQUIREMENTS:

- Arduino IDE
- Python IDE : pycharm
- Operating system : Raspbian
- RAM : 4 GB

1.5 HARDWARE REQUIREMENTS:

- Altrasonic sensor
- Raspberry Pi
- Camera module
- USB Speaker
- Battery

CONCLUSION AND FUTURE SCOPE

The newly designed stick is in line with human ergonomics, since it is intended for adult users. Blind prototype stick is tested for various obstacle heights and front door. Smart blind stick technology includes the use of ISD 1820 ultrasonic sensor and voice module. The function of voice module is to feed warning back. Here we use an ultrasonic sensor that alerts only one voice message when the distance of the barrier in any movement is detected in 50 c.m. If

we use more sensors, the voice module warns by providing more voice messages that can provide more input and identify the obstacle in different c.m. The framework presented is planned for practical use and configured. The system can handle seven states which can challenge the blind. The device will respond to each state according to a specific program in the Arduino microcontroller which is coded and mounted. It is suggested that a simple, inexpensive, configurable, easy-to-handle electronic guidance system provide effective assistance and help for blind and visually impaired persons. The system is designed, put in place, checked and confirmed. The system's real-time findings are encouraging; it reported a 93 per cent accuracy in distance detection. The results show that the program is powerful and exceptional in its ability to define the source and distance of the objects that the blind may encounter. It can search areas left, right, and in front of the blind person whatever their height or size. Those who took part in the test also favored it. The ultrasonic sensor was extensively used to advance the independence of blind and visually impaired individuals in a healthy and independent manner.

The incorporation of smart sensors and artificial intelligence enables the blind stick to detect obstacles, changes in elevation, and other environmental factors, delivering prompt and context-specific voice alerts. This not only improves the user's situational awareness but also contributes to a more confident and secure mobility experience.

Furthermore, the voice alert system adds a layer of convenience, allowing users to receive information without relying solely on tactile feedback. The seamless integration of technology into a traditional mobility aid enhances its functionality without compromising its ease of use. As we move forward, continued advancements in technology, such as improved sensor capabilities and enhanced machine learning algorithms, may further refine and expand the capabilities of voice alert-based smart blind sticks. This holds the promise of even greater independence and inclusivity for individuals with visual impairments, ultimately fostering a more accessible and supportive environment for all.

FUTURE SCOPE

The future scope for voice alert-based smart blind sticks holds great promise in enhancing the independence and safety of visually impaired individuals. As technology continues to advance, these devices can incorporate more sophisticated features, such as real-time object recognition using artificial intelligence

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