Electronic Walking Stick

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Table of Contents

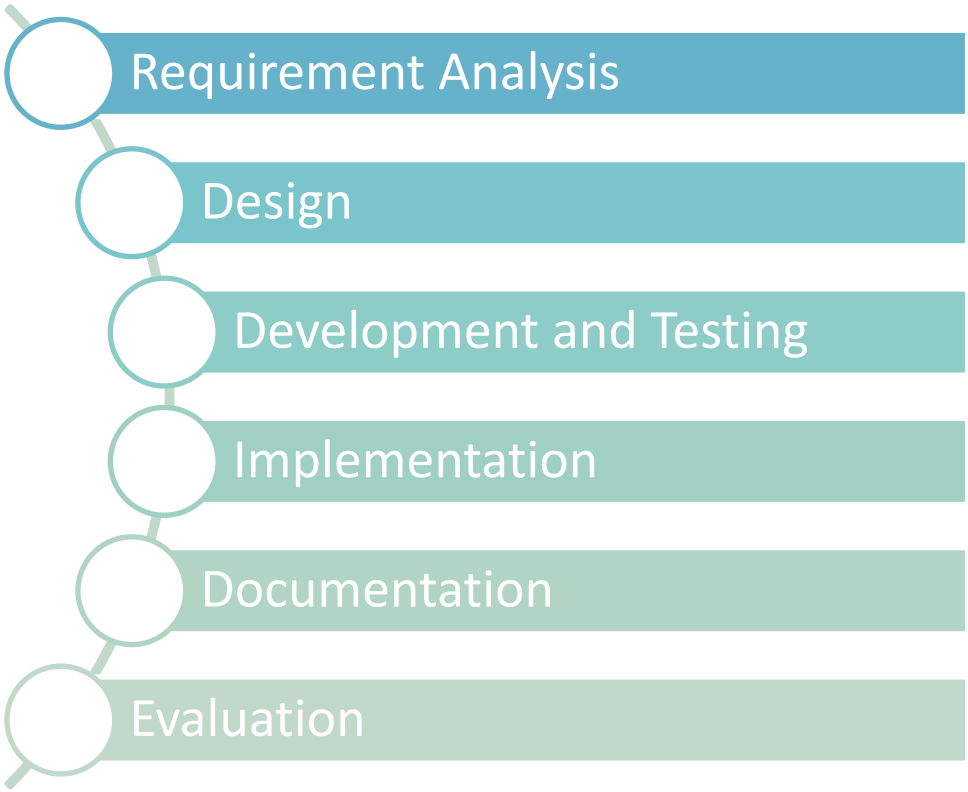
Introduction

According to a recent survey, there are 37 million blind persons worldwide, 15 million of them live in India. Worse, 75% of these blindness cases may have been avoided. As a result, there is a critical need for improvement in the status of the visually impaired in India. Obstacle detection is a difficult and time-consuming task for visually impaired people.

The Electronic Walking Stick (EWS) is a suggestion that will assist the user in detecting obstacles. It can automatically detect an impediment in front of the person and provide feedback by shaking the walking stick and emitting a warning sound for the user while also acknowledging the surrounding people.

System Development Life Cycle

System development life cycle is the standard process adopted for creating and maintaining an information system. It has got six stages as follows.



For our project, all six stages were performed.

- First, we had analyzed the need of society.
- Then created solution design and requirements
- Developed solution using embedded C language and microcontroller ATMega 32.
- Created test cases using requirements and tested the developed system
- Deployed solution on Git hub
- Performed all the necessary documentation
- Evaluation of solution in the market and gathering feedback to improve it further

Requirement Analysis

This section details the initial requirement analysis findings. We will use 5Ws framework and SWOT analysis technique to assess the business need and requirements.

5Ws and H Framework

- **Who** are we trying to help?
  Visually impaired people from economically weaker sections of the society who are still not in condition of buying the expensive solutions already existing the market. We are also looking forward to cater different governments which would in turn can help in making accessible and economically feasible on a larger scale.

- **What** is your Product Vision?
  Vision is of the Electronic Walking Stick (EWS) will help the user in obstacle detection. It can automatically detect the obstacle in front of the person and give them a feedback response by giving a warning sound. The EWS will also help the user in indication to other people of the user in dark/less illuminated region. With our hard work and dedication, we will try our best to bring out the product to a market level and will try to enhance our product by working on all the features we mentioned in future scope. One goal that remained fixed throughout the process of creating the walking stick was to keep the product affordable. It had to be something that people from economically weaker backgrounds would not hesitate to buy. And they wanted to keep it simple and easy to use as well.

- **Where** should we start?
  Government organizations and blind schools are the best places to start with.

- **Why** will we succeed?
  Our products affordability and effectiveness are the factors which differentiate us from other solutions already existing in the market.

- **When** should we launch?
  The launch should be done immediately as it is necessary to assess public awareness to avoid the helplessness.

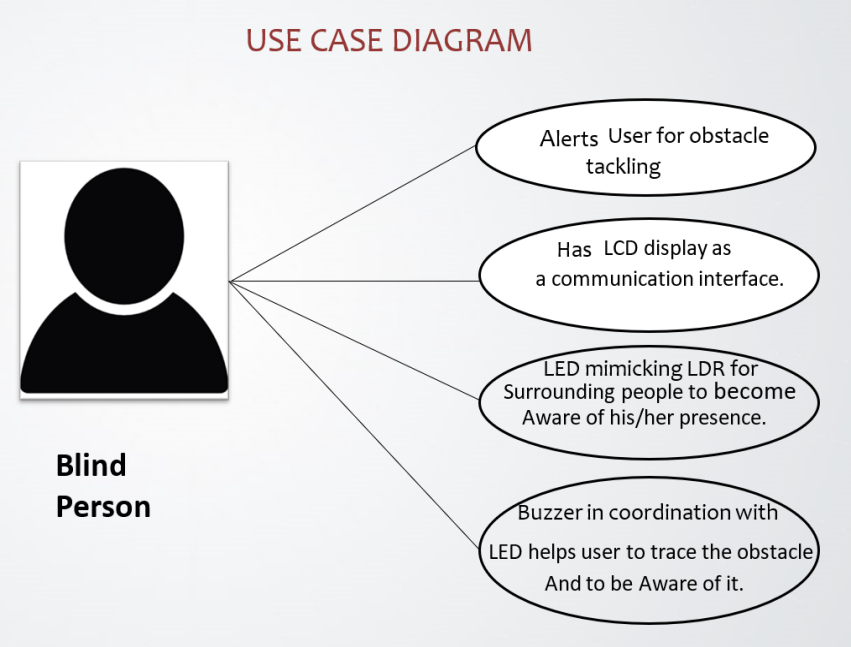
- **How** will we do it?
  We will use embedded C language for the coding part and microcontroller ATMega 32 for designing of the circuit.

SWOT Analysis

- **Strength -** Effective concept and price money will attract users.
- **Weakness –** We can't cater to people who are visually impaired and deaf at the same time.
- **Opportunity –** Starting with NGO's and blind schools can make them adoapt the product at an early stage which we will beneficial for them in the longer run.
- **Threats -** If the product works well, it can be implemented by other users, so we need to bring in enhancements frequently to distinguish the product and make it hard to replicate easily.

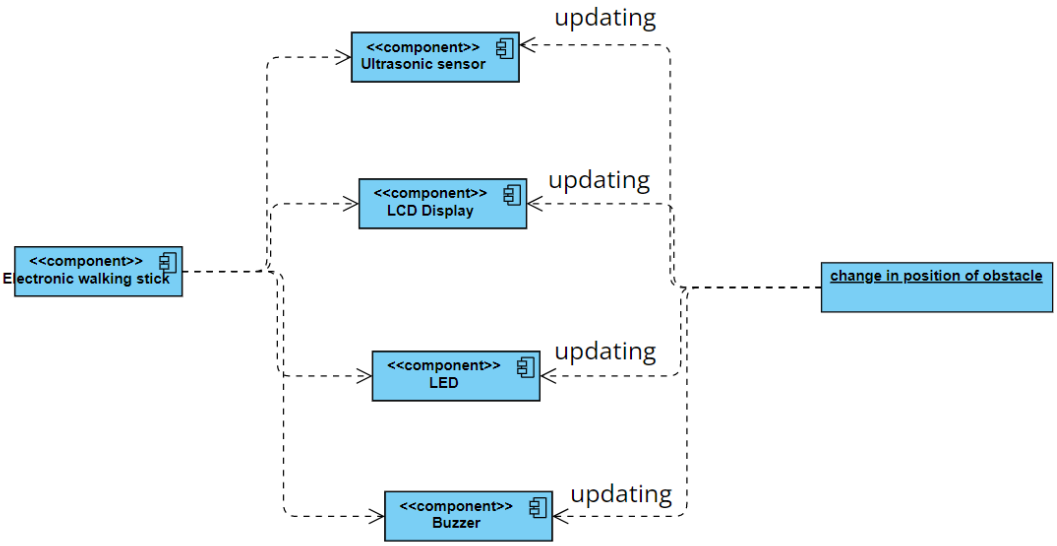
Behavioral Diagram

Use Case Diagram



Structural Diagram:

Component Diagram



Requirements/Solution Design

This section details the requirements and solutions created for our system.

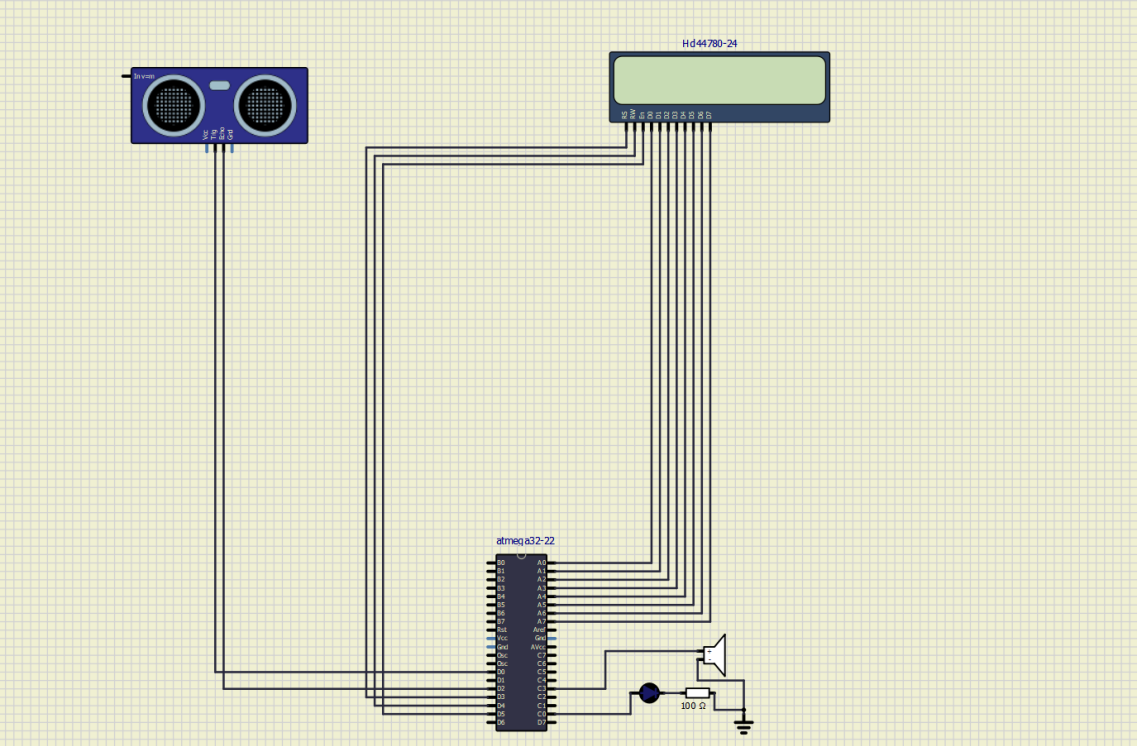
High-Level Requirements:

- Allow the user to depend on our product and reduce its dependency on others.
- Introducing the stick at ground level such as NGO's and blind schools can help them adopt the mechanism which would them in a longer run.
- Allow the user to be successfully guided with the help of ultrasonic sensor,led and buzzer.
- As the obstacle changes its position , the user in turn gets updated by the change in frequency of the beeping sound of the buzzer.
- Led in turn makes the surrounding people aware of the presence of the presence of the visually impaired person in a dark room etc.

Low-Level Requirements

- We'll be having a circuit box in our hardware prototype which will be carrying all the circuitry.

    - Obstacle detection works on the principle of an ultrasonic sensor
    - Mechanism begins with the trigger pin of the sensor sending the signal and getting reflected back to the echo pin of the sensor followed by the calculation of the distance between the user and the obstacle.



- The Lcd shown display the status of the obstacle near the user and it gets updated whenever the obstacle changes position near the user.

    - If the obstacle is 100 m away from the user the lcd display will show up 100m and the turn the led will blink and the buzzer will beep.
    - If the distance betwwn the tworeduce to say 80 or 70m , the lcd will show that particular distance and in turn the frequency of the blinking of the led will increase and this in turn will increase the frequency with which thw buzzer beeps.
    - Here, in the simulide we can't show the lcd display changing the value of the distance since there is no provision of the placing an obstacle in front of the sensor. That's why the working is conveyed through an led and a buzzer.
    - A screen with below-mentioned rules should be displayed to the user.

Test Plan and Results

This section details out test plan and results achieved on testing the software.

TEST CASE #	COMPONENT	TEST CASE	RESULT
1.	LED	When distance less than 100. Blinking frequency should be (1/2000ms)	Pass
2.	LED	When distance less than 70. Blinking frequency should be (1/500ms)	Pass
3.	LED	When distance less than 50. Blinking frequency should be (1/100ms)	Pass
4.	Buzzer	When distance less than 100. Beeping frequency should be (1/2000ms)	Pass
5.	Buzzer	When distance less than 70. Beeping frequency should be (1/500ms)	Pass
6.	Buzzer	When distance less than 50. Beeping frequency should be (1/100ms)	Pass
7.	Ultrasonic sensor+LCD	Changing the distance when the obstacle changes position	Pass