Talkative Assistance System for Visually Impaired People

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Abstract— Blindness is frequently used to describe severe visual impairments with or without residual vision. The usage of infrared ranging scheme with the aid of android application is in itself a major technological advancement. For any type of movement, the blind people use only their natural senses such as touch or sound for identification or walking. In this paper, we talk about the talkative assistance system which provides a real-time application model which incorporates the latest technologies to provide efficient and smart electronic aid to the blind. The objective is to guide blind people with voice navigated GPS using a SST microcontroller with the help of Artificial Intelligence. The features of this model are to detect the obstacle for collision avoidance, also it detects the objects in directions - left, right and front.

Key words: IoT, Sensors, Microcontroller, Android Application, Blind Aid Stick, Artificial Intelligence

I. INTRODUCTION

Blind people face the toughest situation walking from one place to another without any help. This aid stick is best suited for this particular situation when no help is offered. This application enables the user to be on his/her own and no help from others is required. The proposed work consists of light weight blind stick and sensor based obstacle detection circuit is developed to help the blind person to navigate alone safely and to avoid any obstacles that may be encountered, whether fixed or mobile, to prevent any possible accident. The main component of this system is the infrared sensor which is used to scan a predetermined area around blind by emitting-reflecting waves. The reflected signals received from the barrier objects are used as inputs to the SST microcontroller used here. The microcontroller is then used to determine the direction and distance of the objects around the blind.

II. LITERATURE SURVEY

Due to high cost and lack of accuracy many blind aid sticks were not successful. There were many such projects introduced based on this same idea. We will talk about some of those here. Prof Shruti and Prof. Sakhre introduced a smart stick having GPS to keep track of locations using ultrasonic obstacle sensors to detect obstacles, artificial vision - all controlled by a microcontroller. It had a camera fitted onto the person's head which used some algorithms to detect obstacles. This was a cost efficient model but the design was too complex and also it was bulky and wearing over the head was not feasible. Another model was then developed by Calder, David J and Curtin which used pulse echo technique was used to detect obstacles which provided warning sound when obstacles were detected. This was used by US military for locating submarines. But the main drawback here was high power consumption. Then Rohit Seth developed another model called the "Smart White Cane" which was cost efficient and accurate. But lack of GPS tracking in the model is the major setback here.

III. FEATURES OF PROPOSED SYSTEM:

- Object detection on front, back, left, right.
- Separate voice announcement for the same is given using Apr kit.
- 6th sense vibrator is switched on after detection of object.
- Location of the blind person can be taken by the guardian using AI.
- GPS Co-ordinates are plotted using G-Map server in the guardian's smart phone.
- Problematic situation are alerted to the guardians using double tap accelerometer method.
- Voice announcement to the guardian is done even though the smart phone is in silent mode.
- Auto complaint facility is given for nearest police station using Map My India.
- Condition of the blind person can be known using photos taken using artificial intelligence.

IV. ADVANTAGES OF PROPOSED MODEL:

- Low power consumption
- Easy and fast to install
- Scalable
- Feasible
- Economical
- Reliable

V. METHODOLOGY

The proposed design for smart stick consists of

1) The SST Micro controller Unit.
2) The Obstacle Detection Unit.
3) Voice Announcement Kit
4) Alphanumeric LCD
5) Vibrator
6) Power Supply Unit

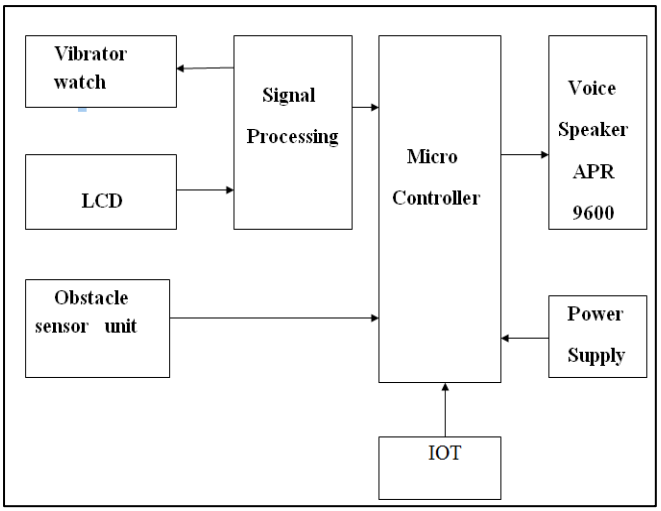

Fig. 1: System Architecture

When IR sensors emit waves, obstacles are detected and data is sent to SST Microcontroller in serial binary sequence. The model has camera & photo detector to capture images when the person is in danger. When an obstacle is detected by the IR sensor, the vibrator vibrates and then the message about the person being in danger is relayed to guardians through relay coils.

VI. COMPONENTS USED:

A. SST Microcontroller

The main centre of the project is microcontroller. The flash program memory supports both parallel programming and in serial ISP. Parallel programming mode offers gang programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. It has 5V operating voltage from 0 to 40MHz. To a dedicated port number 3Rx is used obstacle range detector. Port 1.0 and port 1.1 are connected to Left and Right Infra-Red sensors respectively for detection of obstacles. Port 1.2 is connected to a panic button which works during a distress call. Port 0 is connected to a 16x2LCD display. Port 2 connected to relay contacts via two transistors. When obstacle is detected current flows through current limiting resistor of base two transistors thereby magnetizing the relay coils which activates the buzzer .BASCOM 8051 is the software used for microcontroller programming with embedded C language.

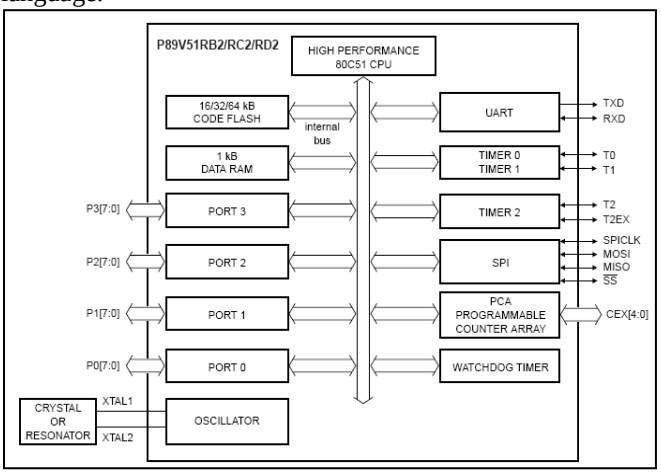

Fig. 2: SST Microcontroller

B. The obstacle detection unit

Obstacle detection unit consists of Infrared range detector kit and 2 sensors .The IR sensors send signals to detect obstacle and on detection, depending on the speed of the signal, it sends binary serial signals on Rx pin of the microcontroller. The duration of vibration depends on range of the obstacle. Camera & photo detector in IR sensors are used to detect and send perceived messages to the microcontroller. The blind person depending on the duration of vibration can detect whether the obstacle is in left or right. The range of the IR sensors can be modified within its specified limit.

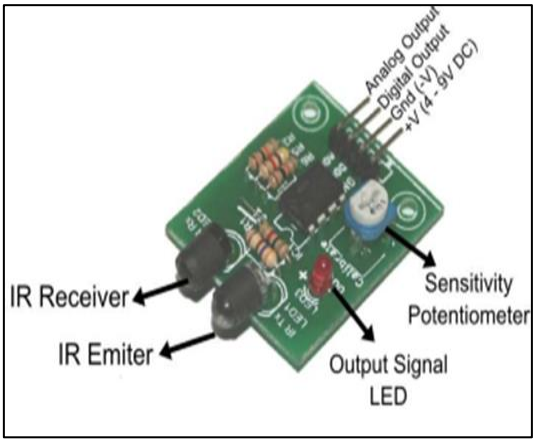

Fig. 3: IR Sensors

	Hurdle Recognition	
Direction	Sensor used	Distance Range
Front	Front IR Sensor	0-50cm
Left	Left IR Sensor	Up to 50 cm
Right	Right IR Sensor	Up to 50 cm

Table I:

C. Voice Announcement Kit

Single chip, high quality, audio/voice recording and playback solution. Operating voltage range is 3V-6.5V DC. The voice recording length can go upto 680 seconds(1.8 minutes at 8 Khz sampling rate). It is a powerful 16-Bits digital audio processor.

Fig. 4: Voice Board

D. Vibrator

A vibrating motor is essentially a motor that is properly balanced. It is an off-centered weight attached to motor's rotational shaft that causes motor to wobble. These are generally found inside cell phones, pagers, gaming controllers and messengers.

Fig. 5: Vibrator

E. Power Supply circuit

A 5V Lithium-ion battery is used here for providing power supply to the model. It is a type of rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging. These are one of the most popular types of rechargeable batteries for portable electronics with a high energy density, tiny memory effect and low self-discharge.

VII. CONCLUSION

This system proposes the design and architecture of a new concept of a smart electronic guiding stick for blind people. In developing better applications for continuous assessment of surroundings, advancement in Mobile technology will further help. Technology of Wi-Fi can be included along with IOT. The advantage of the system lies in the fact that it can prove to be a very low cost solution to millions of blind people worldwide. The key features are simple, design, efficient yet easy to use and modify architecture and system design. Hence, it can provide a low cost device for millions of blind people in the entire world. The proposed combination of various working units makes this a real-time system that monitors position of the user and provides dual feedback making navigation more safe and secure for the blind.

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