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The Smart Guide Cane for Assisting the Visually Challenged for Indoor

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Abstract: -This paper introduces the concept of the Smart Cane that will use to guide the visually challenged person while walking. Cane is nothing but a hollow stick that is commonly used by the blind one usually. Here the cane is improved by using the sensors for obstacle detection, moisture and fire detection in their environment and to guide them towards their destination. Here we developed the hardware of the Smart Cane by using Atmega328 microcontroller and the outputs are display on the LCD.

Keyword: -*Smart cane, sensor, Atmega328.*

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I. INTRODUCTION

Vision is one of the basic senses of human and in their absences a person has to face many challenges in their daily lives. Among 5000 almost 1 person is blind. As visually impaired he has to face challenges like bumping into obstacles, may he slip due to water on the floor and many more while walking. All the time he needs a guidance of a guide, without guidance he can't take even a step.

Blind person normally uses the normal stick or a cane as a support while walking. Many of these persons are using the white cane which is widely used as a travel aid for the visually challenge person. This is a kind of mechanical device for the detection of the obstacles on ground, uneven surfaces and other hazards. This can be folded and slipped into a pocket and also lightweight. The problem with this device is that the user must be trained to use it over 100 hours. The white cane is not efficient to detect the potentially dangerous obstacles at the head level.

Also the guide dogs are capable for guidance, but they requires extensive training. Also the fully trained dogs are expensive and exist for few years only. and it is really difficult to take care of the another being as they even can't take care of themselves as a blind person. As a result only few blind people have the guide dogs for guidance while walking.

Keeping all this in mind we are working on the cane. Where cane is nothing but a hollow stick which can be used by the elders and the visually impaired people for support while waking.This project aims to make the guide cane even smarter with the help of the technology to improve the safety of the visually impaired person and also to easy their lives. This project is consisting of the pair of "The Smart Cane" along with "The Embedded Pocket". This system is consisting of the sensors like ultrasonic sensor, thermal sensor, and moisture sensor, the RFID, audio circuit and head phones for the obstacle avoidance, object detection and to ease their live.

II. LITERATURE REVIEW

To overcome various challenges face by the visually challenge people in their day to day lives, several researchers have introduced various devices consisting of the sensors and the sometimes laser technology to improve the safety of them.

Melvin Varghese, Kean Rodrigues, ShreeprasadManohar, VinayakKodkani, ShantanuPendse introduced the smart guide cane which is designed for the easy navigation of the visually challenged person, obstacle detection, to avoid the rocks. This system is consisting of the ultrasonic sensor to detect the obstacles from the floor level. This doesn't provides the particular object detection. [1] Young Chung, Sanghag Kim and Kang Hycon introducedthe system consisting of the smart cane which is paired with the smart phone app. using Bluetooth V2.0 serial protocol and is designed to detect an obstacle through ultrasonic sensor and guide the blind person towards their destination and also increases the utilization the network through smart phone. This system needs the network which can sometimes problematic. [2]G.Gayathri, M.Vishnupriya, R.NandhiniandMs.m.Bhanupriya introduced the Smart Walking Stick to alert the visually impaired person over an obstacle, pit and water and help them while walking with less accidents. This system is consisting of the walking stick along with the ultrasonic sensor, water sensor, GPS receiver headphone and speaker. In this system the headphone is connected to the stick which is difficult to handle. [3]Mohamed Monufali, Ahmed Aladwani, SaifAlseraidy and Ali Alabdouli introduced guide cane consisting of the prototype of an intelligent device facilitates the movement of the blind person with the warning about the obstacles nearby to easy their lives. [4]Maria Chaudhry, Dr. Muhammad Kamaran, Shehzad Afzal introduced the speaking monument along with the RFID, ultrasonic sensor and GPS technology facilitates the object detectionand obstacle avoidance. This system is bulky to wear all the time. [5]Iwan Ulrich and Johann Bornstein introduced the guide cane with the mobile robot for the safe navigation and avoidance of the

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obstaclesand other hazards. This system is bulky due to the wheel and the servo sheerings. [6]

III. PROBLEMS IDENTIFIED

Many devices that can be designed for the guidance of the visually challenge person have seen. They may consist of some problems which may cause difficulties for them.

- Some of these devices consisting of the headphone that is directly connected to the cane which is very difficult to handle.
- Also there consisting of the keypad not reasonable for the blind person.
- The speaking monument is a wearable computing device which is really bulky to wear all the time.
- Sometimes if the cane is away from the user the stick can't be found as these devices don't have such a facility.
- These devices aren't having the facility to detect the fire or the hot object near the visually challenged person which may danger his life.

IV. OBJECTIVES

To overcome all these problems, our objective is to design the smart guide cane with the use of the technology.

- Fire and hot object detection for the visually impaired person as it may risks their life.
- Sensing the water on the floor to prevent them from slipping.
- Will facilitate the object identification.
- Tracing the blind person during the emergency conditions.
- Detection of the cane if the cane is away from the blind person.

V. PROPOSED WORK

This proposed system is consisting of the smart cane and the embedded pocket which will completely work as the smart guide for the visually impaired person.

A. *Smart Cane Module*

The power supply is applied to the system is the regulated DC. Generally we preferred the microcontroller here to process all the things going in system which is the heart of the embedded system. The water sensor is connected with the microcontroller for sensing the water on the floor. The ultrasonic sensor is connected for the obstacle avoidance, the thermal sensor for sensing the fire and the hot objects. And the RFID reader for the object detection. The transreceiver CC2500 is also connected to the microcontroller for the wireless transmission of the signals to the embedded pocket module. Buzzer is also connected it to help the use to find the cane if the cane is away from the user by creating the buzzing sound. This whole system is on the smart cane module.

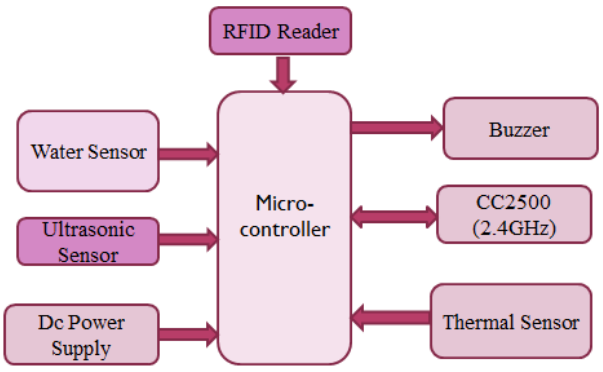

Fig 1: Block diagram of Smart CaneModule of theproposed system

B. *Embedded Pocket Module*

The power supply applied here is the regulated DC. Generally we preferred microcontroller to process all the things going in the system which is the heart of the embedded system. Key is connected with the microcontroller to make the buzzer sound from the smart cane module, the transreceiver CC2500 is connected for the wireless receiving of the signal transmitted from the smart cane module, the GSM-GPS system is connected to the microcontroller and also to the headphone for the audio clues. This whole system is on the embedded pocket module.

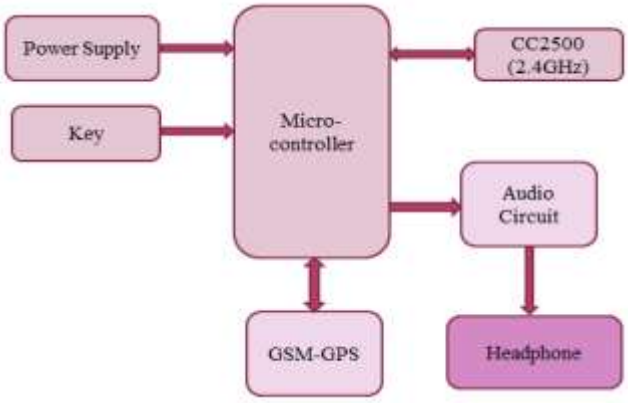

Fig 2: Block diagram of Embedded Pocket Module of the proposed system

VI. CIRCUIT DIAGRAM

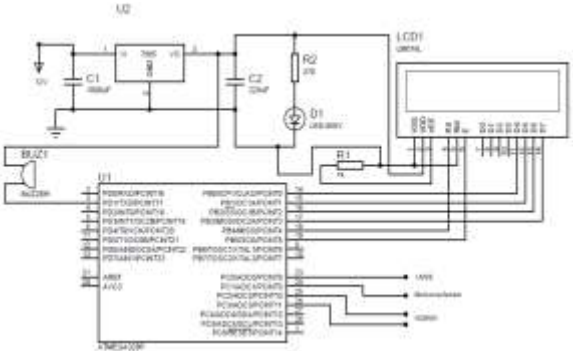

Fig. 3: Circuit diagram of Smart Cane Module along with the sensors

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We require 5V dc regulated power hence we used the 7805IC that converts the 12V to 5V. To smoothen the power 470uF capacitor on 12V side and 220uF capacitor on 5V are used. The led with 270ohms resistance is used for the indicating power on board according to ohms law.

Here controlling unit is microcontroller. We are using an Arduino firmware controller that is AVR family microcontroller, ATMEGA328. The ATMEGA328 microcontroller is 28 pin microcontroller that works on the supply voltage of 5V. The temperature sensor LM35 and the moisture sensor have an output in terms of the analog voltage. The LCD is connected to the B port of the microcontroller. Also the ultrasonic module is used to sense the distance of the obstacle from the stick. The ultrasonic module is connected is HCSR04. The module has four pin which are trigger, echo, Vcc and ground. The trig and echo pins are connected to the ATMEGA328 controller.

C. *Microcontroller ATMEGA328*

Microcontroller Atmega328 is 8bit microcontroller of Atmel's Mega AVRfamily with low power consumption. Atmega328 is based on RISC architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega328has 32KB self-programmable flash memory, static RAM of 2KB and EEPROM of 1K Bytes.Atmega328 is a 28 pin microcontroller having 32 x 8 general purpose register. There are 23 programmable I/O lines which are divided into three ports named as Port B of 8 bit, Port C of 7 bit and Port D of 8 bit.Atmega328has various in-built peripherals likeUSART, ADC, Analog, SPI, JTAG etc. Each I/O pin works on alternative task related to in-built peripherals.

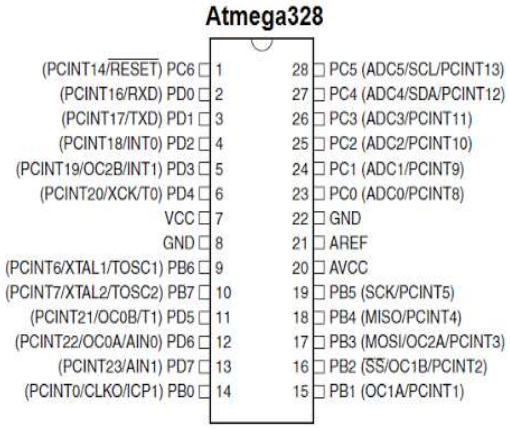

Fig 4: Pin diagram of Atmega328 microcontroller.

VII.CALIBRATIONS

A. *Calculations to be performed by Host microcontroller during obstacle detection :*

Speed of ultrasonic wave is 347 m/s equivalent to 0.0347cm/µsec(Temperature dependent)Timer count multiplied with 200nsec (0.2µsec), internal clock period gives the echo time (say, Et).

Speed = distance/time

Echo distance (Ed) = echo speed (Ev) *echo time (Et)

Distance (Ed) = 0.0347cm per µsec (Ev) * Et µsec

The obtained distance will be twice the actual distance since it gives them to and fro distance of the object as per the to and fro time equated to the equation: (i.e., Et stands for 2Et). Thus the obtained distance divided by 2 gives actual distance of the obstacle.

Actual distance = Ed/2.

As per the above illustration your equation is,

Ed = Ev *(Et/2)

Et = 2 * Ed /Ev

Et = (2/0.0347) *Ed

Et = 58 *Ed

Ed (in cm) = Et (in µsec)/58

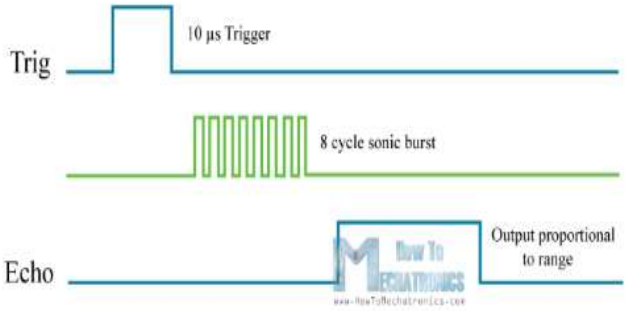

Fig 4: Pin diagram of Atmega328 microcontroller.

B. *Calculations performed by Host microcontroller during hot object detection :*

The resolution of AVRs ADC is 10bit and for reference voltage we are using 5V so the resolution in terms of voltage is,

5/1024 = 5mV approximately --- (1)

So if ADC's result corresponds to 5mV i.e. if ADC reading is 10 it means

10 x 5mV = 50Mv

As we saw ADC results are in factor of 5mV

For 1°C the output of LM35 is 10mV,

1°C=10mV output by LM35 --- (2)

5V=1024 unit ADC output resolution

1V=204.7 unit ADC output resolution

10mV=2.047 unit ADC output resolution--- (3)

Eq. 3 equivalents to 10mV≈2 approximately

Hence from Eq 1, 2, 3

1°C=2 unit ADC value

VIII. RESULTS

Fig 5: Obstacle is detected through the ultrasonic sensor.

Above figure shows the obstacle detection. Here obstacle is detected through the HC SR-04 ultrasonic sensor.

Fig 6: Moisture is detected through the water sensor.

In above figure shows the moisture on the floor is detected. This moisture is detected through the water sensor. Here the aluminum probes are used to measure the conductivity.

Fig 7: Hot object is detected through the thermal sensor.

The above figure shows the hot object detection. Here the hot object is detected through the LM 35 temperature.

IX.CONCLUSION

The module that we have developed in the second phase is completed. In this module the cane is interfaced with ultrasonic sensor, water sensor and temperature sensor. All these sensors are working properly. The third phase of development, is inclusion of the voice kit and CC2500 transmitter and receiver, after which the total research work will come to an end.

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REFERENCES

[1] Melvin Varghese, Kean Rodrigues, ShreeprasadManohar, VinayakKodkani, ShantanuPendse. “The Smart Guide Cane – An enhanced walking cane for assisting the visually challenged”.978-1-4799-8187-8/15/$31.00©2011IEEE.The International Conference on technologies for Sustainable Development (ICTSD 2015) Feb.04-06 2015, Mumbai, India.

[2] Young Chung, SanghagKim and Kang Hycon. “The Smart Cane Utilizing a Smart Phone for the Visually ImpairedPerson”.978-1-4705145/1/14/$31.00©2014IEEE 3rd Global Conference on Consumer Electronics (GCCE).

[3] G.Gayathri, M Vishnupriya, R.Nandhini, Ms.M.Bhanupriya. “SMART WALKING STICK FOR VISUALLY IMPAIRED”. IJECS Volume 3. Issue 3rdMarch, 2014 PP 4057-4061.

[4] Mohamed Manoufali, Ahmed Aladwani, SaifAlseraidy Ali Alabouli. “Smart Guide Cane for Blind People”. 978-1-4673-0098/8/11/$26.00 ©IEEE.

[5] Maria Chaudhary, Dr. Muhammad Kamran, Shehzad Afzal. “Speaking Monuments–Design and Implementation of RFID based Blind Friendly Environment”.978-1-4244-2239/7/08/$25.00©IEEE. Second International Conference on Electrical Engineering March 2008.

[6] Iwan Ulrich and Johann Bornstein. “The Guide Cane – Applying Mobile Robot Technologies to Assist the Visually Impaired”.Transaction on System, Man and Cybernetics – Part A: System and Human, volume 31 no 2, March 2001, PP 131-136.

[7] MohdHelmyAbdWahab, AmirulA.Talib, HerdawatieA.Kadir, AyobJohari, A.Noraziah, RoslinaM.Sidek, Ariffin A. “Smart cane: assistive cane for visually impaired people”. IJCSI Vol.8 Issue 4, July 2011.

[8] Benjamin J. M., Ali N. A., and Schepis A. F., 1973, “A Laser Cane for the Blind”. Proceedings of the San Diego Biomedical Symposium, Vol.12, PP.53-57.

[9] Yusro M, Hou K. M., Pissaloux E, Shi H. L, Ramli K and Sudiana. D, “The 6th International Conference on Human System Interaction (HSL) .PP.70-77, 2013.”

[10] J. Borenstein and I. Ulrich. “The Guide Cane – A Computerized Travel Aid for the Active Guidance of Blind Pedestrians” IEEE Int. Conf. Robotics Automation, Albuquerque, NM, PP. 1283-1288, April 1997.