International Journal of Computational Intelligence Research
ISSN 0973-1873 Volume 13, Number 4 (2017), pp. 479-484
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A Novel Approach to Object Detection and Distance Measurement for Visually Impaired People

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Abstract

This paper describes the implementation of short range Object detection and distance measurement device with sensors for blind people. By using an ultrasonic transducer pair for producing ultrasonic sounds and sensing the reflected sound waves, the obstructions (objects) are detected. Distance measurement is used in a large number of applications such as robotic movement control, vehicle control, blind people walking stick, medical application, etc. Where this paper is focusing on enhancement of blind people walking stick device which help blind people to help themselves in this world. The measured distance data is converted to digital data for the display and sound waves so the user can get the direction of the object and distance between user and object.

Keywords: Sona SwitchTM1 700, AD654 Monolithic Converter, RS-232 serial port.

INTRODUCTION:

Visually impaired people are living in inconvenient compared to ordinary people. They do not get information through eyes. It is true that visual part in the people life is one of the important things. Visually impaired people use assistant device and different method for reducing in convenient in their life. For example, they use well trained animals like dogs, tools such as staff and Braille. But they are still uncomfortable using assistive devices because devices are expensive cost or inconvenient. Therefore, it is necessary that improving performance of assistive devices.

Many individuals are looked into to make partner gadget which dazzle individuals can utilize all the more advantageously. Walking navigation is one of map information provided services by using GPS. This technique provides user position information in the real time through mobile device. Some people are research about technique combine assistive devices with information provided technology for blind people. But, there are transmission problems of environmental information in this technique occur because this technique transmit only voice signal to blind people. It is important that solution of this problem is for safety of blind people.

LITERATURE SURVEY:

VISION is the prime sensory modality among the human senses to gain knowledge about the surrounding world. It provides a feedback mechanism for balanced interaction with the environment and plays a vital role in sensory integration. Vision loss brings a major challenge for living a normal daily life. It can adversely affect one's quality of life in terms of social, psychological, physical and independent performance. According to World Health Organization, there are 285 million visually impaired people worldwide of whom 39 million are blind [1]. Most visually impaired people prefer a long white cane or guide dog as an assistive tool to attend their daily-life mobility activities. A white cane is the most basic, versatile and low maintenance assistive option. Route planning are little difficult to serve with a white cane, as it provides tactile information of things confined to its length [2].

A guide dog is useful for recognizing and maintaining a strategic distance from deterrents and also hazardous circumstances in the travel way [3]. Laser Cane [4], Teletact [5] are laser augmented canes. These canes are useful for detecting floor-level to head-level obstacles in front of them. A subject needs to continuously scan the surrounding environment as these canes use very narrow beam laser devices. The distance measurement in these devices is susceptible to interference due to natural light. Laser cannot detect transparent glass as its beam traverses through the glass without being reflected. Furthermore, the high cost and the significant expertise required to operate these devices is a major concern.

Ultrasonic is a kind of concentrated energy, can go far away. So it is suitable to use to detecting obstacles. At present, researches on guiding the blind with the ultrasonic wave have been carried out, but they all focused on detecting obstacles in front of the walker, ignoring the information about the obstacles overhead, as in [6].

Many people are researched to make assistant device which blind people can use more conveniently. Walking navigation is one of map information provided services by using GPS. This technique provides user position information in the real time through mobile

device. Some people are research about technique combine assistive devices with information provided technology for blind people [7].

PROPOSED MODEL:

The following are used in the construction of device, Sona SwitchTM1 700 Ultrasonic Sensor AD654 Monolithic Voltage-to-Frequency Converter, Two small headphone speakers, 15 Volt power source, Breadboard, resistors, capacitors, and minor circuitry.

The Sona SwitchTM1 700 Ultrasonic Sensor (Electronic Design and Packing, Livonia, Michigan) is the primary segment of the ultrasonic running framework. This sensor utilizes a beat of ultrasonic waves to decide the separation to snags. The sensor has two fundamental components: 1) a DC: voltage yield that is a straight simple of the separation measured and 2) an internal switch. These two elements are utilized to create a framework that capacities in a simple or computerized method of location.

The simple method of recognition was refined by utilizing the DC voltage yield of the ultrasonic sensor. Utilizing PC alignment programming, the sensor was adjusted by means of a RS-232 serial port to deliver a DC voltage yield running directly from five Volts on items distinguished ait 1.5 feet or less to zero Volts on articles recognized at twelve feet or more. The simple voltage created by the sensor was associated with the voltage input (stick 4) (of the AD654 Monolithic Voltage-to-Frequency Converter. The AD654 (Analog Devices, Norwood, Massachusetts) is a solid voltage-to-recurrence converter comprising of an info intensifier, an accuracy oscillator framework, and a high current yield organize all consolidated into a solitary eight stick DIP chip. The AD654 changes over the DC voltage from the Sona Switch into an AC square wave recurrence. This recurrence yield (stick 1) was then associated with two little earphone speakers consequently delivering a discernible recurrence of tweets that fluctuated relatively with changes in protest discovery remove.

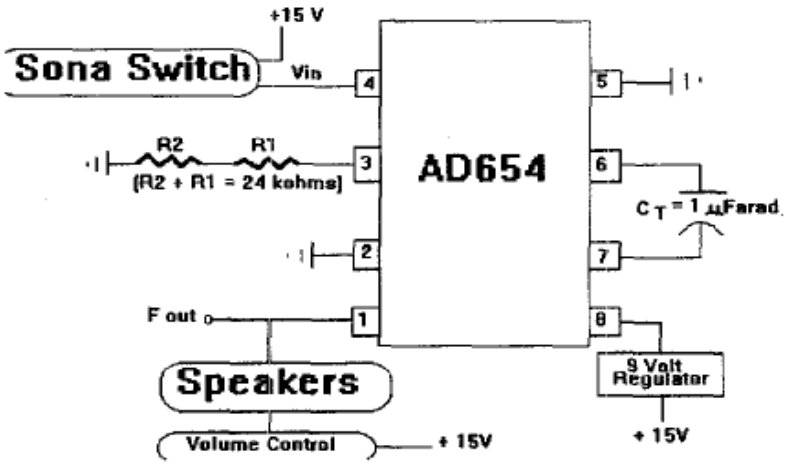

Fig-1: Sona SwitchTM1 700 Ultrasonic Sensor

The recurrence yield of the AD654 changed relatively to the yield voltage from the Sona Switch 1700 Ultrasonic Sensor With a voltage contribution of five Volts, a recurrence of twitters yield of 20.8 Hz could be accomplished. The computerized method of location was expert by utilizing the interior switch of the ultrasonic sensor and by introducing an outer hardware switch. The outer switch disengages the simple DC voltage yield line driving from the ultrasonic sensor into the AD654 voltage input (stick 4). In the meantime, the outside switch reconnects the voltage input (stick 4) to a five Volt controller, and transfers the AD654 ground (stick 2) through the interior switch of the sensor. Upon protest discovery, the inward switch closes permitting current to deplete from the five Volt controller through the AD654 into ground.

The AD654 then delivers the comparing recurrence yield of 20.8 Hi. The interior switch was PC adjusted to close at protest recognition profundities not exactly or equivalent to five feet.

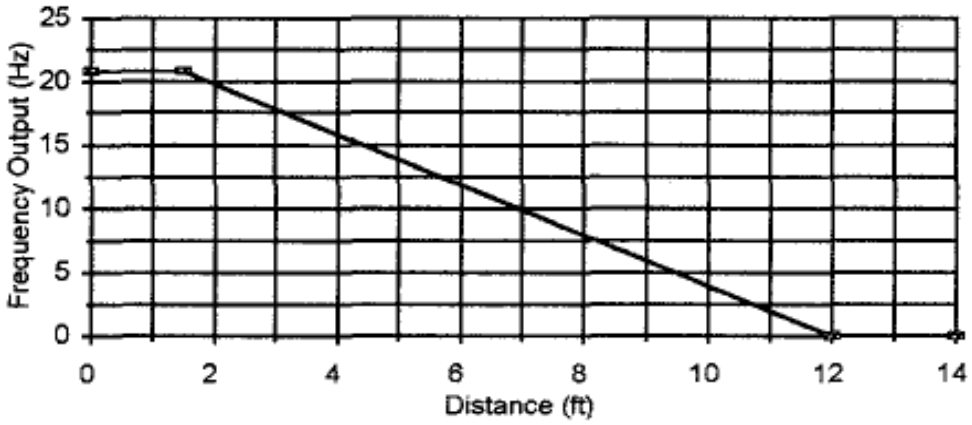

Fig. 2: Frequency v/s Distance Graph

This gives the client a "caution" when they are inside five feet of an approaching obstruction. The Sona Switch 1700 sensor was mounted on a lightweight protective cap permitting the client to acquire a perusing in whichever bearing their head focuses. It likewise takes into account amazing reverberation beat reaction and less wave aggravation because of the cone like wave yield edge of the sensor. The speakers were the stereo "Walkman" sort without a headband. Power was provided to the sensor, AD654, and speakers by a mean Volt 650 mAmp-hr. control source. The AD654, control source, and other circuit parts were fastened to a breadboard. The breadboard was encased in a plastic experimenter box and joined to the client's belt. The power source which was developed of twelve 1.25 V batteries was likewise encased in a different experimenter box and connected to the client's belt. Volume control, earphone and power jacks, and the sensor input interface jack were additionally fused into the hardware and experimenter boxes.

CONCLUSION:

The ultrasonic going framework created satisfied its motivation in that it extended the natural recognition go for visually impaired people and decreased the requirement for the strolling stick. The simple method of discovery permitted the client to frame a mental photo of nature in view of the diverse examples and frequencies of twitters evoked. Then again, the computerized method of discovery fundamentally served to caution the client of close-by obstacles.

A couple of enhancements could be made to expand the accuracy of the framework. To start with, utilizing diverse discharging and getting ultrasonic transducer sets could diminish the issue of ultrasonic rakish misalignment. Putting the getting transducer at an edge to the reflecting surface that is weren't from the transmitting transducer edge will permit a greater amount of the resound beat reaction to be caught. Diverse reverberate beats caught by various getting transducers could then be coordinated by a chip to give the right separation to protest figuring. Additionally, the utilization of a laser transducer would sidestep the issue of ultrasonic precise misalignment. Because of a restricted measure of undergrad research finances, this choice has not been investigated.

Decreasing the size and weight of the ultrasonic sensor would enormously enhance the ergonomic capacities of the framework. The Sona SwitchTM1 700 ultrasonic sensor is a round and hollow gadget around six inches in length and one inch in width. Planning a high determination sensor sufficiently little to fit on a shirt pocket would give the client more solace. A littler sensor would likewise permit the client to store the gadget all the more effectively. Of all the conceivable enhancements examined on the ultrasonic going framework, lessening the size (of the sensor while keeping up a high level of sensor determination is generally essential.

In conclusion, this method of using ultrasonic waves in object detection could also be extended to other uses such as collision avoidance in automobiles. A device using an ultrasonic emitter / receiver pair combined with analog to digital converting system has already been proven successful. There are many applications of ultrasonic detection that may be available in the future, and as shown by this project, Ultrasonic ranging for blind individuals is definitely one of them.

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