Development of Smart Height Measuring Scale

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Smart Height Measuring Scale

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***Abstract*— The system proposed here is a smart height measuring system. A smart height measuring system has been developed in this project. There are several methods used to measure human height. In this research, we develop a human height measurement scheme. In our scheme, we calculate the height with an Ultrasonic sensor. Two round-looking parts in the ultrasonic sensor are called the ultrasonic speakers. When a 40 kHz sound wave collides with a solid surface, it bounces back (echoes). The echo is detected by the other. We may estimate the distances between the sensor and the item by measuring the overall time it takes to complete this operation. It measures the height of a human more accurately (2 cm to 13 feet). We have an extra feature comparing to the existing market products and that is Mobile Application. We can easily take the measurements using the app.**

Keywords— height measurement, ultrasonic sensor, automation, measurement principle, mobile app.

I. INTRODUCTION

There are several methods used to measure human height. Nowadays, several theories and researches for height measurement methods are presented. People use several machines of scales to measure height. A new height measurement method of irregular objects is proposed in this paper. In our scheme, we calculate the height with an Ultrasonic sensor and mobile application. The experimental results show that the relative error is less than any other, which improves the efficiency and accuracy of height measurement, and it realizes the automation of the measurement process and can satisfy the requirement of real-time.

The system is based on Arduino UNO and HC-SR04 ultrasonic sensors. The height will be measured using an ultrasonic sensor. Ultrasonic is made up of two round shape components that are ultrasonic speakers [1]. One of them sent a 40kHz sound wave into the air and let it bounce off the solid surface. When it receives the bounce back, the other will try to identify the echo that is created. The entire time required to finish this operation will provide us with the lengths between the sensor and the object. Then this data input will go into Arduino. Then Arduino will read it and sent it to the Android app via Bluetooth module.

In industries, measuring the exact height of any object or product properly and precisely is essential to maintain quality and the required function. This instrument is based on the aforesaid idea; it is simple to operate; all that is needed is to place the object in the box.

When we use conventional distance or height measuring instruments like a Venire caliper or a screw gauge to measure a compressible or soft object, we receive an inaccurate result since they all have jaws that compress the item.

However, because there are no jaws to compress the item in the SONAR height measurement equipment, we can properly measure the distance or height of compressible objects in it. Because height can vary throughout the day, generally being greater in the morning, height should be measured at the same time every day to guarantee consistency. This is a low-cost, quick-to-conduct test [2].

The project's purpose is to measure the height of items more precisely than other typical height measuring equipment such as a Venire caliper or a Screw gauge. In industries, measuring the exact height of any object or product properly and precisely is critical to maintaining quality and the required function. It's simple to use; all one has to do is place the thing in the box. The device is based on a Bluetooth module that sent the output into the android mobile application.

II. LITERATURE REVIEW

There are some existing projects related to our project. One of the project names is “The human-height measurement scheme by using image processing techniques”. In this study, they create a non-contact human height measuring methodology using a fixed laser point triangular distance measuring approach [3].

Another related project is “Tree height measurement based on image processing embedded in smart mobile phone”. The goal of this paper is to deal with the problem of measuring the tree height processing image on a smartphone. In this procedure, they employed a smartphone with a camera and a benching marking. A benching marker with red-colored ends was leaned

against the tree tightly and parallel to the tree trunk before the tree photo was snapped. The top point of the tree picture was then extracted based on their color characteristics. Also obtained were the coordinates of the two marker locations at the end of the benching marking. Finally, using triangle similarity theory, the tree height may be calculated. The results of the experiments suggest that the relative measuring error of tree height is around 5% [4].

However, another different project named "MS5534B Pressure Sensor and Its Height Measurement Applications" is also an interesting project. MS5534B is a digital output pressure sensor. Here, the authors present a method for building a height measuring system using an MS5534B pressure sensor, as well as hardware and software design concepts for the system [5].

After all our project is different from these projects.

III. Proposed System

As the existing products in the market are cost-effective so that we have developed a system that is less costly and very easy to use. Side-by-side people can get the measurement through the smartphone. The gadget is powered by a Bluetooth module that sends data to an Android mobile app. Since our system is very fast to use, it will be very helpful to military recruitment or in medical to measure the height fast.

IV. Materials And Methods

Arduino UNO:

The Arduino board is a specifically designed circuit board for programming and prototyping with Atmel microcontrollers in order to create digital gadgets and interactive things that can sense and manipulate real items. It was used to compute the object's height and show it on the LCD screen [6].

Figure 1: Arduino UNO

HC-SR04 Ultrasonic Sensor:

The HC-SR04 ultrasonic sensor, like bats and dolphins, utilizes sonar to detect the distance to an object. From 2cm to 400 cm or 2cm to 13 feet, it provides outstanding non-contact range detection with high precision and reliable readings in easy-to-use packaging. Sharp rangefinders are impacted by sunshine and dark material, but this one isn't. It comes complete with an ultrasonic transmitter and receiver module. [7].

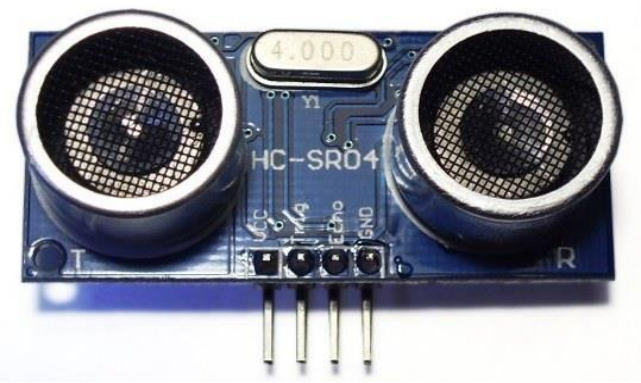

Figure 2: HC-SR04 ultrasonic sensor

LCD Display Screen:

As a medium of the interface between the microcontroller and the user, we've selected a 16X2 LCD display.

Figure 3: LCD display (16x2) with pin diagram.

Bluetooth Module:

Bluetooth is a wireless technology standard for transmitting data between fixed and mobile devices over short distances and creating a personal area network (PANs). The distance between the two points is around ten meters (30 feet) [8].

Figure 4: Bluetooth module HC-05

Arduino IDE setup:

Using Board management, Arduino allows the installation of third-party platform packages.

•From the Arduino website, install Arduino 1.6.8.

•Open the window after starting the software [9].

Installing with Boards Manager:

Using Boards Manager, Arduino now permits the installation of third-party platform packages starting with version 1.6.4. Packages for Windows, Mac OS, and Linux are available (32 and 64 bit).

•Install the most recent upstream Arduino IDE (version 1.8 or later). The most recent version may be found on the Arduino website.

•Then Start Arduino. Now w have to open Preferences window.

•Enter http://arduino.esp8266.com/stable/package_esp8266com_index.json into the Additional Board Manager URLs field. You can add multiple URLs, separating them with commas.

•Open Boards Manager from Tools > Board menu and install esp8266 platform (and don't forget to select your ESP8266 board from Tools > Board menu after installation). [10]

Hardware implementation:

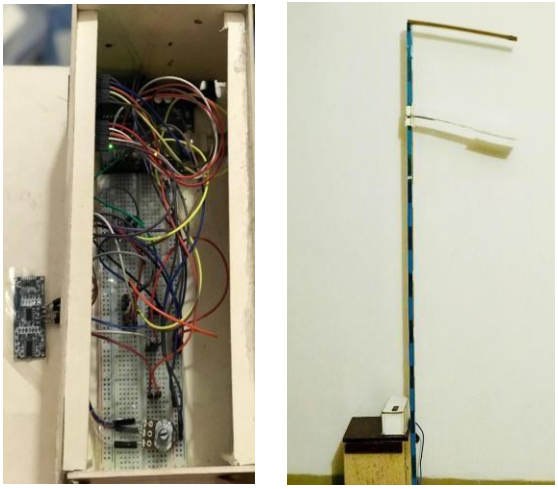

Figure 5: Hardware implement

Measurement Principle:

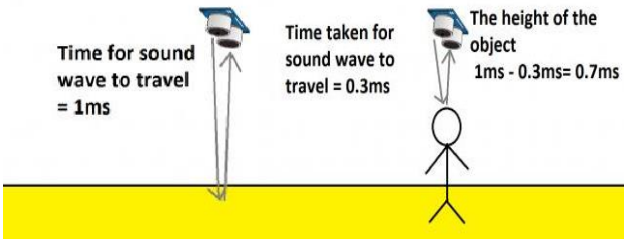

Figure 6: Measuring principle

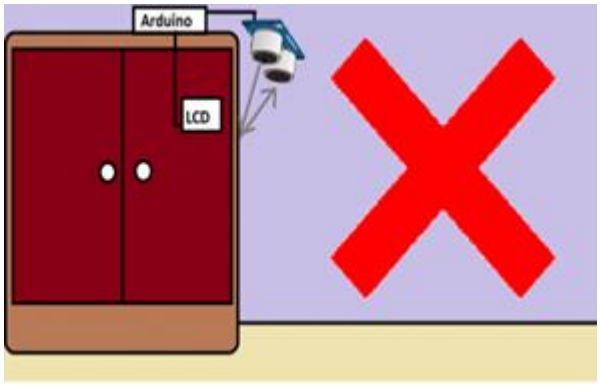

Figure 7: Setup caution (part 1)

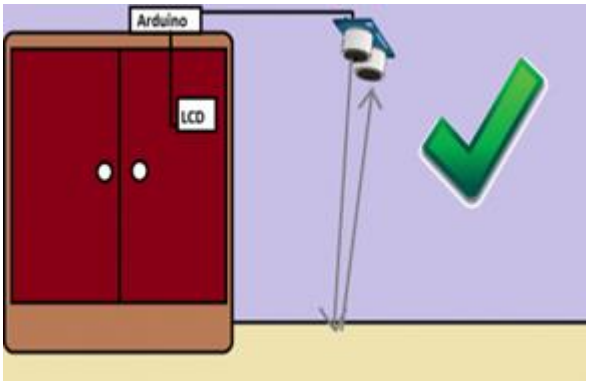

Figure 8: Setup caution (part 2)

In the working principle, the ultrasonic sensor has two parts. Transmitter and Receiver. The transmitter creates a sound wave of 40 kHz. Then it is reflected by any object or human and reflected wave received by the receiver.

In Fig: 6 we can see,

Total time for sound wave to travel = 1ms. Time taken for sound wave to travel = 0.3 ms

The height of the object = 1ms – 0.3 ms = 0.7 ms

Now to measure the distance we have used a formula:

Distance= (time x speed of sound) / 2

Using this formula we can measure the accurate height of any object or human.

Technical Design:

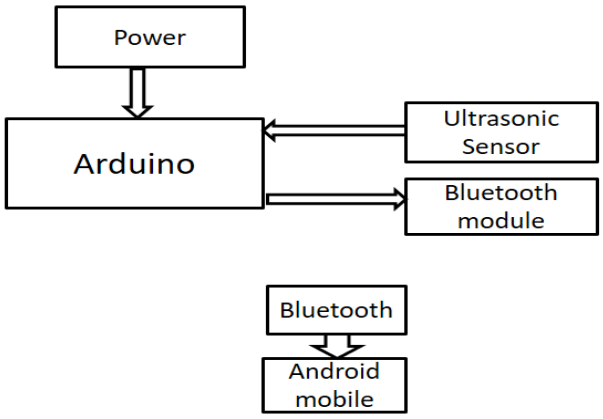

Figure 9: Technical design

Figure 9 shows the technical design of our project. The system is based on Arduino UNO and HC-SR04 ultrasonic sensors. Ultrasonic sensor sense object and that data input will go into Arduino, then Arduino will read it and sent it to the Android app via Bluetooth module.

V. Results

Distance from sensor = d = 39.83cm

Height of the box = h = 208 cm Height

of object = H = ?

Height of object = Height of box – distance from sensor. Now,

H= h-d = (208– 39.83) cm

So, H = 168.17 cm.

Figure 10: Human height Measurement and output in the mobile app.

One thing about the design is ultrasonic sensor hasn't to be placed near any box or object. So, the sensor will detect the object or box, so it shouldn't accurate height. It should be a bit far from the stand so that it can sense accurate height and the ultrasonic sensor couldn't detect black color that's why we have used white paper over our head as our hair's color is black.

VI. Conclusion

A smart height measuring system has been developed in this project. It may be used to measure the height of things with greater accuracy and precision than other commonly used height measurement equipment. The device is based on a Bluetooth

module that sent the output into the android mobile application. This digital height meter is easy to construct and cheap. It can be helpful in military recruitment and in hospitals.

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