UNIVERSITI TEKNOLOGI MARA SARAWAK

FINAL YEAR PROJECT REPORT

(EEE368)

A SMART MEASURER DIGITAL RULER SYSTEM

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ABSTRACT

Length in definition is to be said as a distance between two points. Measuring distance and length in real life has always been relied on physical measuring tools such as rulers, measuring tape and ropes. Even in the past before mankind relied on physical tools, distance was measured using parts of the human body. Ideally, a modern and futuristic length measurer would be built to modernize and ease how we measure and calculate distance. Sound wave travels in the air can be reflected to where it came from. As such, ultrasonic sensor is one of the finest instruments that will act as a main component for this project. The main modules used in the proposed system are the Arduino UNO for the microcontroller followed by HCSR04 for its main input. In addition, a DHT22 sensor will also be used for accurate measurement application. The HC-05 Bluetooth module and a smartphone with operating Android 4.4 or higher are needed to transfer and display data using the Bluetooth Serial Terminal application. Lastly, the system main output will be displayed through I2C LCD Display and an RGB LED signal indication.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Humans are gifted with great minds to operate and amazing body parts that can be worked on many things. Before the inventions of technologies, algebra and discovery of science, mankind maximized the uses of body parts to measure length and distance. Long ago, the human body served as the primary point of reference. For example, the cubit was a unit that measured the distance between the elbow and the fingertips. This unit was employed in ancient societies such as Mesopotamia, Egypt, and Rome. The length varied from region to region, ranging between 450 and 500 mm [1]. For thousands of years, human body-based length units have been utilized. This pattern persisted until roughly 200 years ago, when a significant shift occurred. As the Age of Discovery ended and industry expanded predominantly in Western Europe, it became imperative to standardize length units on a worldwide scale [1].

As the time passes by, engineers, ones that identify and solve engineering problems [2] and inventors of the modern age are still utilizing physical and analogue tools to measure and calculate distance. Although the length and distance of one very large room or object is limited due to the capability of the tool itself, the need for it still has been appreciated until this day. A long and sturdy ruler, flexible measuring tape and calliper are of the few length and distance measuring tools [3].

Ultrasonic on the other hand is the technology that was invented to revolutionize measuring quantity. The origins of medical ultrasound trace back to sonar techniques pre-World War II, where sound waves inspired early investigations. Pioneers like Sokolov and Mulhauser explored ultrasonic waves for detecting metal objects and flaws in solids. Post-WWII, Japan led the way in medical applications, presenting findings on gallstones and tumours in the 1950s. Simultaneously, the United States made strides in cancer detection using ultrasound, introducing real-time imaging and Doppler techniques. Innovations included handheld scanners, showcasing the continuous evolution of ultrasound technology for impactful medical diagnostics [4].

CHAPTER 2

LITERATURE REVIEW

1.1 INTRODUCTION

The distance measurer project combines a variety of components to create an effective and versatile system for accurate distance measurements. The HC-SR04 ultrasonic sensor plays a crucial role, utilizing a transmitter and receiver to emit and receive ultrasonic pulses. By measuring the time it takes for these pulses to travel and return, the sensor calculates precise distances [9]. Simultaneously, the DHT11 temperature and humidity sensor contribute by gauging ambient conditions, employing a thermistor for temperature readings and a humidity-sensitive resistor for humidity values [10].

The Arduino Uno, functioning as the central processing unit, orchestrates the entire system. It receives data from both the HC-SR04 and DHT11 sensors, processes the information, and executes programmed logic to control the other components. The Arduino Uno's versatility and programmability make it an essential element in ensuring seamless integration and accurate processing of sensor data [11].

The I2C LCD display enhances the user interface by visually presenting the calculated distance. Utilizing the I2C protocol, the display communicates efficiently with the Arduino, reducing the pin count and simplifying the overall wiring [12]. The HC-05 Bluetooth module establishes wireless communication, creating a link between the Arduino Uno and an Android smartphone. This module enables the seamless transfer of calculated distance data, allowing for remote monitoring and display on the smartphone [13].