

CHAPTER I

INTRODUCTION

1.1 Background Problem

Monitoring of toddler growth is important considering the growth of toddlers is a golden period because toddlers experience rapid growth. Monitoring of toddler growth age 12-59 months getting growth monitoring services every month, minimum 8x a year [1]. In Indonesia to monitor the growth of toddlers is carried out at Integrated Service Post or at the nearest Community Health Center. To ensure the development and physical growth of toddlers while preventing toddlers from falling in bad conditions, the Bandung City Government seeks nutrition program services in all Community Health Center, including by carrying out monitoring the growth of toddlers and the development of the nutritional state of toddlers is monitored through toddler weighing activities for each month in Integrated Service Post and in places other [2]. The Bandung City Government has made efforts to support success in the growth of toddlers, but it is still not efficient because too much of manpower for only measure weight and height using manual tools. The Family Welfare Movement is sometimes needed to come to toddler house that suffering from malnutrition and stunting, and it will be very struggle to bring the manual weight scale and height meter to the toddler house. Seeing the background of this problem, one of the efficient efforts can be done to help the Bandung City Government by providing convenience for the public to know the status of the health conditions of the toddler through weight and height scale. Therefore, the design of this toddler's weight and height scale measuring instrument is easy and inexpensive as an effort that can be done because it does not need to use a lot of human labor to use it.

Research on the design of Body Mass Index measuring devices has previously been carried out, including Ario Senjaya Galih Argasta from Telkom University who designed Arduino based Body Mass Index measuring devices with output on Liquid Crystal Display (LCD) in 2020 [3], Eka Dwi Lestari from Gadjah Mada

University (UGM) who designed a height measuring device and microcontroller-based body weight with output on Liquid Crystal Display (LCD) [4]. However, these two measuring devices are less practical because they are designed for adults not for toddlers who grow very fast. Observing this, the design of weight and height scale measurement tools for toddlers will be carried out using the same method with reference number 3 using Ultrasonic Sensor HC-SR04, Strain Gauge Sensor, Arduino Microcontroller and Liquid Crystal Display. The Design of height measuring equipment based on the foot length of toddlers on digital weight scales will be carried out further in this Final Project with the title Design of body height measuring equipment based on the foot length of toddlers on digital weight scales.

1.2 Problem Formulation

The formulation of the problem in this final project research is as follows:

1. How to make an instrument that can measure body height and body weight that very efficiently?
2. What is the level of accuracy and precision from the results of body height measuring tool on the prototype of the measuring instrument to be made?
3. How to measure length of toddler feet using an ultrasonic sensor and measure weight of toddler using a strain gauge sensor?

1.3 Objectives

This final project research was carried out with the following objectives:

1. Designing body height measuring devices and weight with Microcontroller, Ultrasonic sensor, and Strain Gauge Sensor in one simple device.
2. Analyze the comparison of the measurement results of the prototype with the results of manual measurements accuracy and have level accuracy $> 98\%$ and the precision $< 1\%$.
3. Make a device that can mount an ultrasonic sensor and strain gauge sensor so the device can measure the height and weight simultaneously.

1.4 Limitation

The limitation in this final project research is as follows:

1. Hardware design is only limited to functional and toddler safety.
2. Research does not discuss the details of data processing performance.
3. This measurement tool can only be used by toddlers who can stand up on their own feet.
4. The use of this measurement tool can only be placed on a flat and hard surface.
5. This tool only measures the toddler in general, not specifically by ethnicity and age.

1.5 Research Method

This final project research was carried out with the following methods:

1. Study of Literature

In the first stage of the research method, an assessment of previous research related to this research was carried out through journals, articles, and other available sources.

2. Data Collection

At this stage, data were collected on samples of the length of the soles of the feet and the height of the toddlers to obtain the formula for the correlation between the length of the soles of the feet and the height of the toddlers using the linear regression method.

3. Research Data

To find the formula, calculations are needed to get results that prove that the length of a toddler's feet and height is directly proportional.

4. Tool Design and Simulation

In this step this design process and tool simulation will be carried out in software.

5. Hardware Realization

At this stage the hardware component will be assembled based on algorithm and design in software.

6. Testing

The component that has already been assembled will be tested with a toddler.

7. Troubleshooting

At this stage, repairs are made to problems in the tool circuit that have been identified.

8. Data retrieval analysis

In this stage, data is collected from each component of the sensor and an analysis of the level of accuracy and precision is made from the results of the measurement tools to the original measurements.