Arduino-based Weight Scale and Height Measurement Tool

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Arduino-based Weight Scale and Height Measurement Tool

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ABSTRACT

Human health is highly impacted by body weight. It will be especially simple for overweight people to get ailments like diabetes, obesity, and heart attacks. In some communities, being overweight is advantageous not only for preserving health but also for their appearance. The perfect instrument for measuring weight and height combines a proximity sensor with a digital scale as a measuring device. This device, which comes in the shape of a scale, calculates ideal body weight. This device uses buttons, including the start and power buttons, as well as an Arduino Uno to operate the complete system. Readings are shown on an LCD 16x2. The BMI calculation is utilized by this tool as a measurement guide.
Keywords: *Ideal Body Weight, Scales, Arduino*

INTRODUCTION

Human health has a significant impact on body weight. It will be particularly simple for overweight persons to develop various forms of obesity, diabetes, and heart attacks. Weight is a valuable asset in various social groups since it impacts people's appearance in addition to helping them maintain their health. Of course, it also has a big impact on getting a job because certain employers prefer to hire people who are physically fit and have good skills. The BMI (Body Mass Index) calculation and the Broca's formula can be used to determine a person's optimal weight, therefore having a scale to measure ideal body weight is highly helpful in managing and regulating weight.

METHODS OF RESEARCH

The steps in the flowchart below are those of a descriptive research study that takes the form of a design on Fig 1. The flowchart describes the overall research process, including how the sensors used in this study can be used to read the results of weight and height measurements. The Power Supply supplies voltage to the Arduino Uno to start the tool, after which the load cell and sensor HC-SR04 are programmed to calculate weight and height, and finally the Arduino is programmed to calculate the BMI (Body Mass Index)

formula that has been entered into Arduino so that the results can be displayed on the LCD. The screen is a 16x2 LCD.

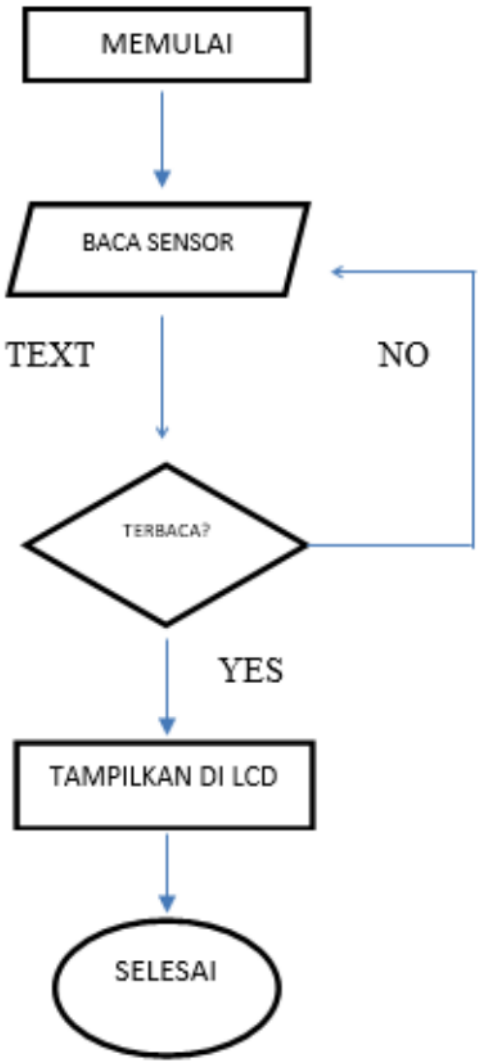


Fig 1. Flow chart

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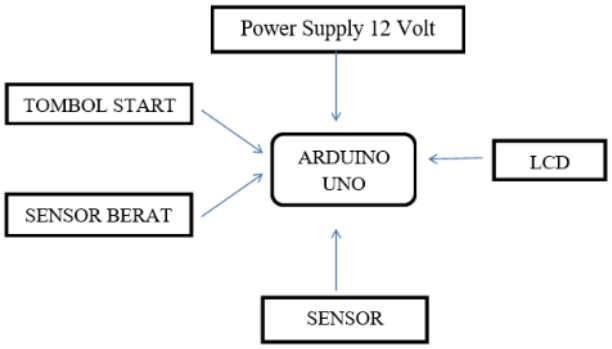


Fig 2. Diagram Blok

At the same time, the LCD reads the output results from the ultrasonic sensor and load cell. The LCF will then display the results of the "ideal," "thin," and "overweight," "obese" BMI values after the BMI formula has been calculated with the existing data. The block diagrams used in this study are as follows at Fig 1.

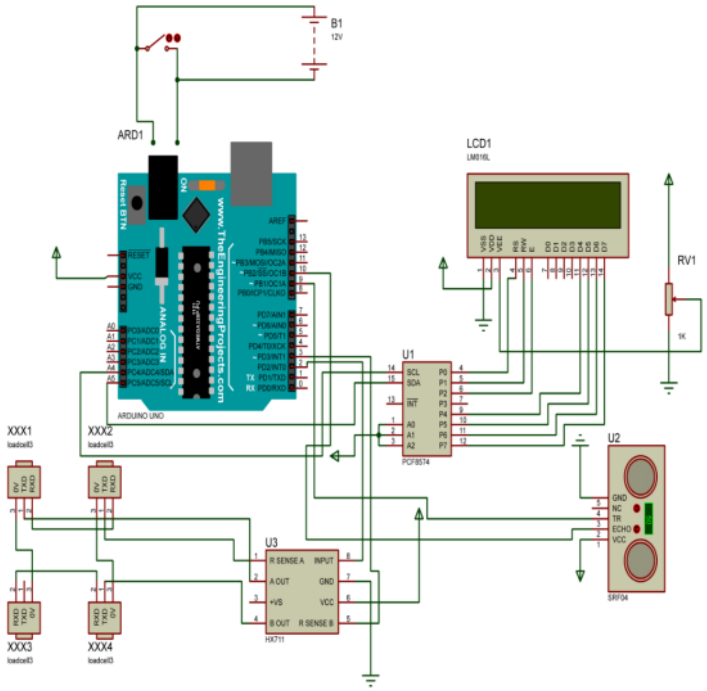


Fig 3. Wiring Block

The block diagram explains how the tool's components work together. The start and reset buttons are used to start or turn on Arduino. Sensor for weight Function for reading and determining the weight that has been set. Sensor of height It reads and calculates the measured height. As a result of weight and height sensor readings, the LCD is operational. Uno Arduino It is used to store programs that control all of the tool's components. A Wiring Diagram is required during the design process to explain the overall planning process.

A load cell sensor is a sensor that measures the pressure or weight of a load. In most digital scale systems, load cell sensors serve as the primary component. Load cells use the pressure principle to make measurements. Wiring Blocks for Load Cells are shown below.

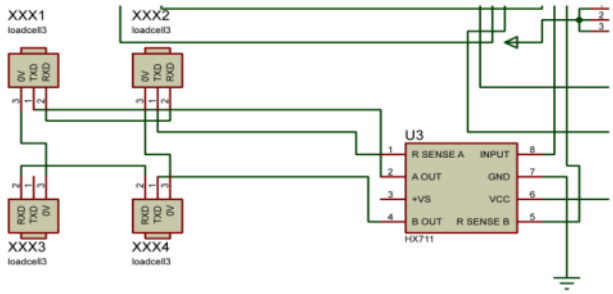


Fig 3. Wiring Load Cell

The HC-SR04 is an ultrasonic sensor that measures the distance between an obstacle and the sensor. This sensor is similar to the PING sensor, but the number of pins and specifications differ.

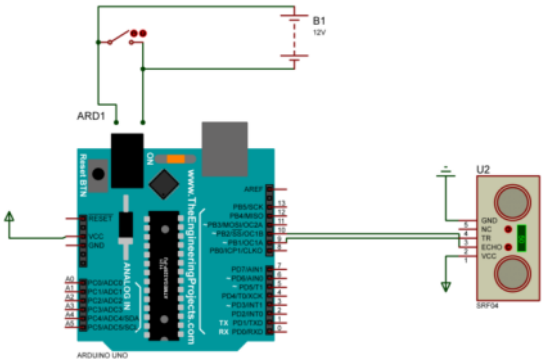


Fig 4. Wiring Load Cell

Following the completion of the design process for the required components, the next research to be conducted is the design of the tool, which in this case is the design of the weight and height measuring devices.

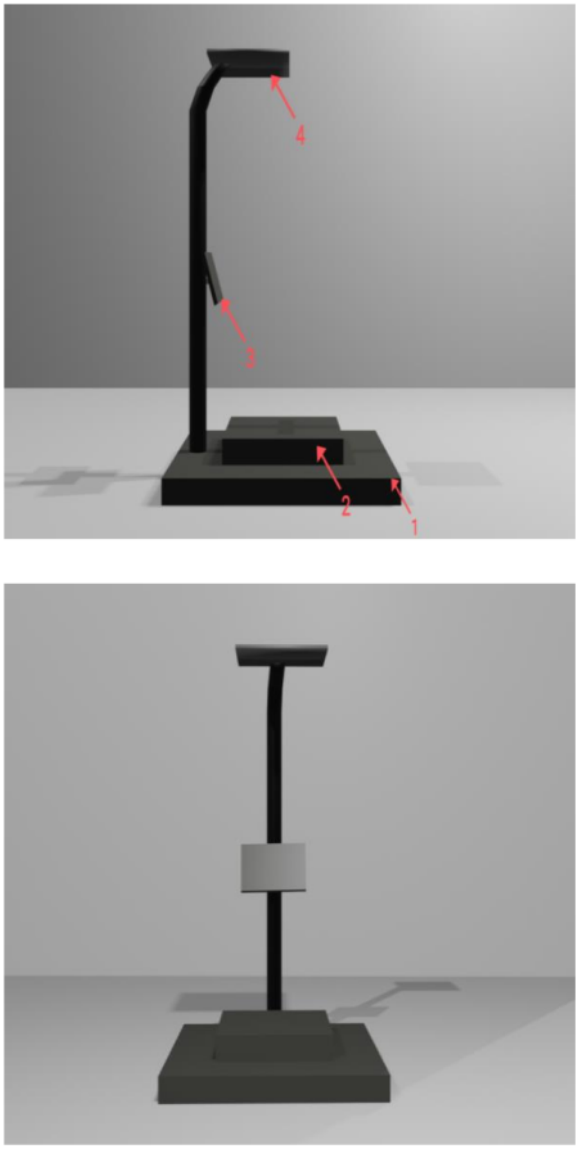


Fig 5. Tool of Development

RESULT

The ideal weight scale tool determines whether or not a person is at their ideal weight. This tool includes an ultrasonic sensor for measuring height and a load cell for measuring body weight. By operating the tool, you can test the Hi function to determine the tool's performance. The Ideal Weight and Height Measurement function with Led Output monitoring table is as follows:

No.	List of functions to monitor	Effective	
		Yes	No
1.	On the on tool press, type the on button.	√	
2.	When the tool is turned on, the display will show the tool's identity.	√	
3.	When the tool is loaded, it begins weighing.	√	
4.	When the tool begins calculating, the BMI (measurement result) is displayed.	√	
5.	After finishing weighing, the tool's display will be set to "Scales of ideal weight and height."	√	

Table 1. Monitoring of Functions

The following is a table of measurement results and comparisons made with analog scales, where from the design results the tool can show BMI values and information on body condition according to the measurement results.

No.	Input	Results of measurement
1	Measurement of height and weight, BMI, and explanation of measurement results is Ideal	

Fig 6. Result of Measurement

a comparison of analog and digital scale designs



Fig 7. Analog and digital scale measurements

Table 2. Results of measurements and comparison with analog scales

Following the results of the experiment, measurements were taken on several people and the results of the measurements were observed; here are the results of the measurements that have been carried out.

No.	Respondents	Measurement		BMI	Description
		Height (m)	Weight (kg)		
1.	YBN	168	58.7	20.80	Ideal
		168	58.5	20.72	Ideal
		168	59.0	20.89	Ideal
2.	WRN	154	58,9	24.82	Obesity
	EFR	156	65.1	26.48	Obesity
	SPI	159	65.3	25.56	Obesity
3.	MBN	166	52.80	18.0	Thin
	WDO	166	52.32	17.0	Thin
	AJW	170	52.56	18.0	Thin

Following that, an assessment of the accuracy value of the measurement results is made; the following are the results of the measurements carried out,

Value:

% Error =

$$\frac{\%Kesalahan\ BMI\ 1 + \%\ Kesalahan\ BMI\ 2 + \%\ Kesalahan\ BMI\ 3}{3}$$

% Kesalahan BMI 1= $\frac{20.80+20.72+20.89}{3} = 20.80$

$\frac{20.80}{20} x100\% = 1.04\%$

% Kesalahan BMI 2 = $\frac{24.82+26.48+25.56}{3} = 25.62$

$\frac{25.62}{25.1} x100\% = 1.02\%$

% Kesalahan BMI 3 = $\frac{18.0+17.0+18.0}{3} = 17,77$

$\frac{17,77}{17} x100\% = 1.07\%$

% Tool accuracy value= $\frac{1.04+1.02+1.07}{3}$ = 1.04 %

=100% - 1.04%

= 98.96%

CONCLUSION

Conclusion of this research Arduino-based Weight Scale and Height Measurement Tool is as follows:

1. Building a device with components such as an Arduino Uno as a microcontroller, an HC-SR04 sensor as a height meter, a load cell sensor as a body weight meter, and a 2x16 LCD to display height and weight results. The scales can function based on the results of the prototype with these components.
2. The height and weight measurement results of this tool have been tested by implementing it on several people using pseudonym names for the purpose of developing existing tools as expected and running smoothly. Based on the data and testing of the module tool using the BMI reference, an average error of 1.04% was calculated, resulting in a percentage obtained for the tool's accuracy of 98.96%.

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