Implementation Of The Iot Device For Sit-Up Counting Based on ESP 8266

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Article Information
Received: 21-11-2024
Revised: 28-11-2024
Published: 5-12-2024

Keywords
MySQL; Sit Up, Website

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Abstract
Sit ups are a type of strength exercise that functions to strengthen muscles. Sit up movements are usually calculated manually, but as technology develops, it is necessary to innovate to build a digital technology-based sit up movement counting tool. The goal is to provide a sit up instrument that is able to accurately calculate the number of sit ups that have been done. The tool is made based on digital technology using the internet of things (IoT). In making this tool, the author uses 2 LDR sensor modules and 2 KY008 laser sensors installed to detect the shoulder. If one of the light sensors in the form of an LDR module is not disconnected from the light displayed by the laser sensor, then the series of sit up counting tools with this application will not calculate the sit up acquisition. The sit up counter tool will calculate if the sit up position is perfect and cut off the laser light, it will send the results of the sit up to the MySQL database which will later be displayed in the web server. This tool is easy to use and portable or easy to move. The way this tool works is quite easy, the user only needs to choose the type of exercise needed, then the tool will calculate the movements done and the user just needs to lie on the side of the tool and prepare to do the display according to the activity to be done. Then the tool will calculate automatically and will enter the website data.

1. Introduction

Today, technology is developing very rapidly, which is inseparable from the development of tools or media that can be used more efficiently, thus providing tangible evidence of improved performance in various fields. (Hanafi, 2021). One of these technological developments is the ESP8266 of microcontrollers. ESP8266 microcontrollers are microcontrollers that already include Bluetooth and Wi-Fi connectivity in a single module.

This ESP8266 has many implementations, one of which is the application of a ESP8266 system to measure muscle endurance in sit-up tests. Athletes often perform sit-ups incorrectly or carelessly, resulting in suboptimal muscle gain.

According to (Adnan), "A test is a tool or procedure that is necessary to measure or determine something in a certain way and according to certain rules." The development and advancement of technology is inevitable in

today's life; Technological advances are in line with scientific advances. Every new invention created can provide convenience in daily activities. One of the areas that has experienced development is sports. In sports, the application of advanced technology is used to improve athletic performance, in line with the function of sports science as a useful discipline for analysis and measurement. According to (Warto), which states that: The development of science and technology capabilities has become one of the dominant factors for the state in educating the nation's life and can improve the welfare of the people. This aims to make it easier for people to obtain information by utilizing the internet network, so that all information can be accessed only using a smartphone.

Sports coaching and training systems require an ideal pattern to achieve good results. According to (Nurhasan 2017), which states that: "In the sports coaching and training system, there needs to be an ideal coaching pattern that must be followed in order to maximize the use of technology." One of the implementations that is usually carried out is the implementation related to measuring instruments in making a measurement. Given the rapid development of technology today, it is very supportive of measuring instrument measurements by utilizing technology. This is because, if a measurement uses technology, it can minimize the occurrence of errors (human error) during data collection. Therefore, using technology will produce data with a relatively high level of validity. A measurement is said to be valid if it can measure what it is intended to measure. (Djali 2017,).

One of the areas that benefits from the development of science and technology is sports. With these conditions, everyone in the field of sports can expand their knowledge about various branches of sports science in different contexts. This can be seen, as in the world of sports, many products are created by utilizing the application of science and technology, which is used as an analytical tool. In the field of sports, there are many exercises that are done to ensure physical and mental well-being. One exercise that can be easily done anywhere and anytime is the sit-up. Sit-ups are generally carried out by athletes, coaches, and the general public. Sit-ups are movements that are performed to strengthen or improve the abdominal muscles. Sit-up exercises are aerobic in nature and not only serve to strengthen the abdominal muscles but also act as an exercise to reduce body weakness and can increase lean muscle mass. Generally, sit-ups are performed with a count of 15 repetitions, with the back of the head tending to be raised involuntarily. It should be noted that during a sit-up, the breath is inhaled as it moves upwards and exhales as it returns downwards. Sit-ups, also known as curl-ups, are physical exercises in which a person uses their abdominal muscles to lift the body from a lying position to a sitting position and then lie back down without moving the legs. In addition to the abdominal muscles, sit-ups also work other muscle groups, including the chest, hip flexors, lower back, and neck, making the sit-up a multi-muscle exercise. Muscle cells are more metabolically active than fat cells. This means that activities in this type of physical exercise can burn calories even at rest. By helping us build muscle, sit-ups will help us burn more calories in the long run. In addition, strong core muscles can help improve posture. Good posture can improve appearance without losing weight.

Usually, the sit-up movement is calculated manually. However, with technological advancements, innovation is needed to develop digital technology-based sit-up counters. The goal is to provide a sit-up instrument that can accurately count the number of sit-ups performed. The tool is based on digital technology using the Internet of Things. (IoT). The Internet of Things (IoT) is a concept in which an object or object is embedded with technology such as sensors and software with the aim of communicating, controlling, connecting, and exchanging data through other devices while connected to the internet. The Internet of Things (IoT) is closely related to the term machine-to-machine or M2M. M2M is a term that refers to hardware that can connect and communicate with each other without human intervention. The components included in the M2M system, among others, are sensors, RFID, Wi-Fi, or any type of cellular and cellular technology. This device also uses a chip controller that functions to control the device that is being made. nodeMCU is one of the digital chips that has many functions, one of which is the calculation function. The calculation function on the nodeMCU is carried out by providing input (sensor) which is used as an initial parameter in calculating the number of sit-up movements. These devices are designed in such a way that they are easy to use and portable or easy to move. The operation of this device is quite simple; The user only needs to select the type of exercise needed,

then the device will calculate the movements performed, and the user only needs to lie down on the side of the device and prepare to display according to the activity to be performed.

Where this tool has 4 (four) LDR sensor modules, 4 (four) KY008 laser sensors are installed to detect the shoulder area, because the sit-up is said to be almost perfect if the shoulder position that was initially lying flat is then raised until it is close to the knee. However, if one of the light sensors in the form of an LDR module is not disturbed by the light displayed by the laser sensor, then the sit-up counter with this app will not calculate the sit-up achievement. The sit-up calculation tool will calculate when the sit-up position is almost perfect and will send the results of the sit-up achievement to a MySQL database connected to PhpMyAdmin, which will later be displayed in the web server application.

Based on the above background and the importance of sit-up motion counting devices, researchers are interested in conducting research on simple Internet of Things (IoT)-based sit-up motion counting devices as digital technology. Therefore, the researcher is interested in proposing the title of the thesis regarding "IMPLEMENTATION of IoT devices for sit-up calculations based on esp 8266."

1.1 Literature Review

In this study, several literature reviews, taken from previous research journals, are needed related to the research title and main discussion, which will be used as a reference or supporting material for the research.

A. Literature 1
   This study aims to determine the performance results of microcontroller-based push-up measuring devices with ultrasonic sensors through product testing. The method used is the R&D method because the final result of this research will produce a push-up measuring device based on a microcontroller and sensor. This device will work automatically as a timer and counter for the number of push-ups performed. It consists of two sensors that will receive a signal when touched by a part of the body at a distance that has been specified in the program. The signal is captured by the receptor and then entered and processed into the microcontroller before being displayed on the LCD screen. Meanwhile, the proposed research created a muscle endurance calculation system for sit-ups using an LDR sensor and a KY008 sensor. The system built can store and display sit-up achievement data using the website.
B. Literature 2
   (Sawal, Saiful Rahman, and Kasrani, 2019), with the title "Design of Microcontroller-Based Pull-Up Counter Exercise Equipment Using Ultrasonic Sensor", this study aims to design a microcontroller-based pull-up counter using ultrasonic sensors, to facilitate pull-up counting. This appliance will be operated using an Android phone connected to Bluetooth HC-05, then press (start/stop) to turn the appliance on and off. Meanwhile, the proposed study conducted a muscle endurance calculation system for sit-ups using an LDR sensor and a KY008 sensor. The system built can store and display sit-up achievement data using the website.
C. Literature 3
   (TALMERA, 2024), With the title Design and Development of an Electricity Monitoring System using ESP32 Based on the Internet of Things (IoT), this study aims to design a system that can monitor electricity usage from users. This system is supported by several components, namely the SCT013 sensor which functions to measure current, and the ZMPT101B sensor which functions to measure voltage. This system is also supported by Telegram Bot to provide notifications in case of excessive usage, and Webserver as an output integrated with the database to store and display data in the form of electricity usage and costs that will be incurred every month. In addition, the study used the MySQL database system and Webserver, as well as developing a tool to measure muscle endurance during sit-ups.
D. Literature 4
   (Muliadi, Imran and Rasul, 2020), With the title Development of Smart Trash Bins using ESP32, In this study, the design procedure consists of two stages, namely hardware design and software design

using C language (which includes the creation of the main program and the creation of the control program) and uploaded through the Arduino IDE. The data analysis technique in this study is a descriptive analysis technique. The result of this research is the design of a prototype of a smart trash can that provides notifications through a smartphone application. Product testing is carried out by testing the supporting components (ultrasonic sensors/rangefinders) and testing the entire system. Meanwhile, the proposed study created a system to calculate muscle endurance during sit-ups using an LDR sensor and a KY008 sensor. The system built can store and display sit-up achievement data using the website.

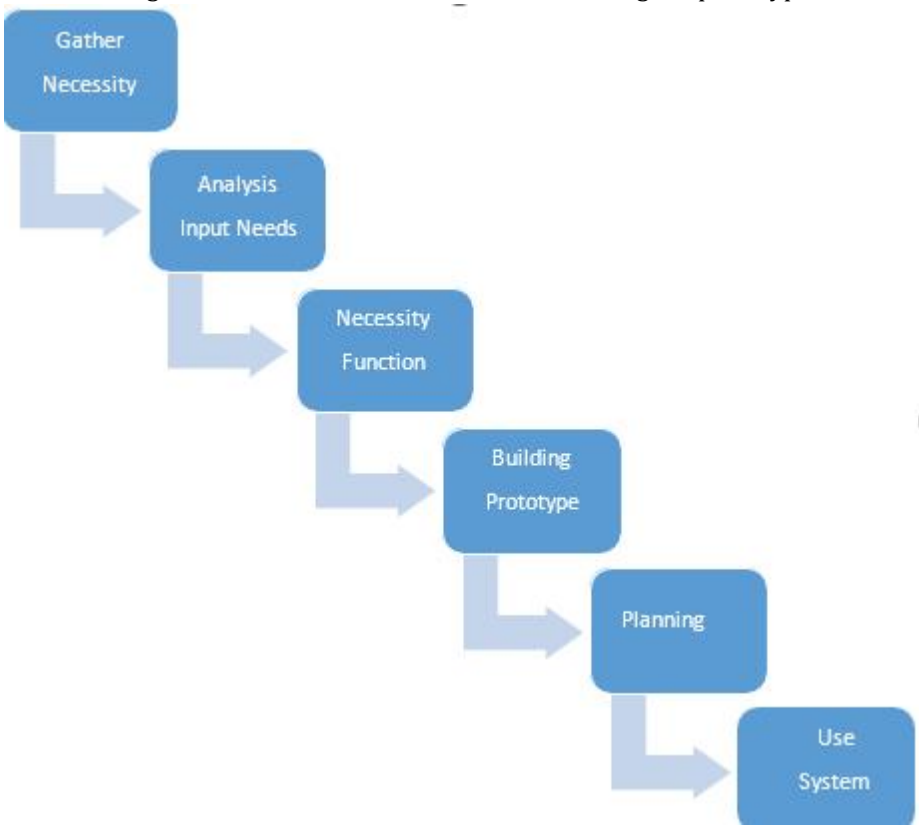
E. Literature 5

Research conducted by (Rindu Dwi Wahyuni 2024) discusses a tool to count the number of people entering and exiting both indoors and outdoors in real-time based on IoT. (Internet of Things). IoT is a technology that can connect devices to the internet to perform several functions. The purpose of this study is to build a people counting system using IoT technology to solve the problem of how to monitor the number of people in the queue automatically and efficiently, and how to activate online queue number reservations. The tools used to build the system are infrared sensors, Arduino microcontrollers ESP8266 Wemos D1 R1 as the main controller of all components, Arduino IDE, and Firebase. From the results of testing and analysis, it was found that the control of electronic equipment to count the number of people operates according to the specified specifications, as long as the system is connected to the internet network (WiFi) stably and continuously.

2. Research Methods

2.1Research stages

This stage contains a research framework regarding the process to be carried out and presents a structured diagram that shows the stages of research that will be carried out using the prototype method.



Explanation:

A. Requirements Collection
Data collection is carried out with a broad identification structure that will be designed by defining the software requirements with the user or owner of the system.

B. Input needs analysis
This stage determines what inputs are appropriate for the research conducted by the author. The author analyzes what inputs can fulfill the function. The input requirement in question is data information on the number of participants who pass through the diode and LDR sensors. (light-dependent resistor).

C. Functional requirements
The functional requirements analysis stage is the phase where the collection of information becomes data. Based on that data, an overview of the functions that the system can perform in the future is created. These functions will be used as answers to the problems identified in the problem formulation.
This system will later have functions including:
   a. This system will have functions such as:
   b. a. It can count the number of sit-ups performed by participants.
   c. b. This can inform how many sit-ups each participant has done.
   d. c. Can visualize data in the database.

D. Design
Once all the information has been gathered from the analysis that has been carried out, it is time to proceed to the basic planning stage of the research. In prototyping for sit-up muscle endurance test and measurement tools, several stages of design are carried out to explain the process from start to finish, making it easier to understand.

E. Build a prototype
The researcher creates a prototype or system that has been determined with the user or owner of the system.

F. System usage
This stage is the final stage of the system development process with a prototype model. Devices that have been successfully tested and passed the evaluation are then ready for use by users or system owners.

2.2 Research stages

The implementation of IoT devices for durability testing and sit-up measurements requires several hardware and software components as follows:

A. Hardware

Table 1. Hardware

No	Hardware Name	Sum
1	Laptop/PC/Smartphone	1
2	MCU Node / ESP32	1
3	Laser KY-008	2
4	LDR sensor module	2
5	LM2596 DC-DC step down module	1
6	12v Adapter	1
7	Rainbow cable	7 meters
8	PCB	1
9	Solder	1

B. Software

Table 2. Software

No	Software Name	Uses
1	Arduino IDE	Used to program the ESP32 NodeMCU Microcontroller
2	MySQL	To store the data obtained from the sensor then enter it into the database
3	Website	To display the results of the sensor in the form of a website

2.3 Gathering Needs

Needs collection is a stage in research conducted to obtain information about the implementation of IoT devices for muscle endurance tests and measurements of sit-up tests and to validate problems in the research.

2.4 System planning

There are two stages of system design in this study, the first is hardware design and the second is software design. This stage combines all the components to connect and integrate with each other.

2.4.1 Hardware Planning

The sit up test muscle endurance measurement system is expected to help humans to make it easier to calculate the results of sit ups and data which can be stored in the database, where this system can be stored in the Display via smartphone/website.

a. Tool range

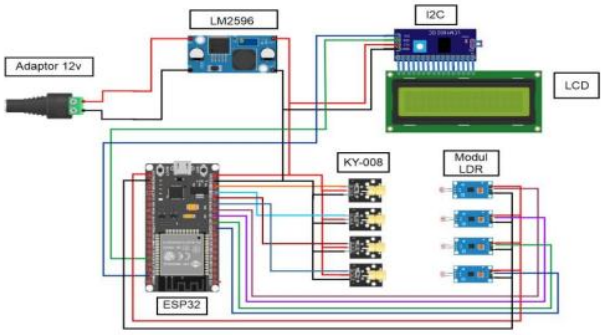


Fig 1. Tool Range

Information:

1. NodeMCUESP32 is used as Microcontroller
2. KY-008 laser is used as a light emitter
3. The LDR module is used as a light catcher
1. by Laser KY-008,
4. LiquidCrystalDisplay is used for network monitoring
2. Wifi/Hotspot on the device
5. The 12v adapter serves as a voltage feeder to the NodeMCUESP32
6. The LM2596 functions as a voltage reducer provided by the adapter

b. Block Diagram

The following is a block diagram that illustrates the workflow of the sit up test muscle endurance calculation system.

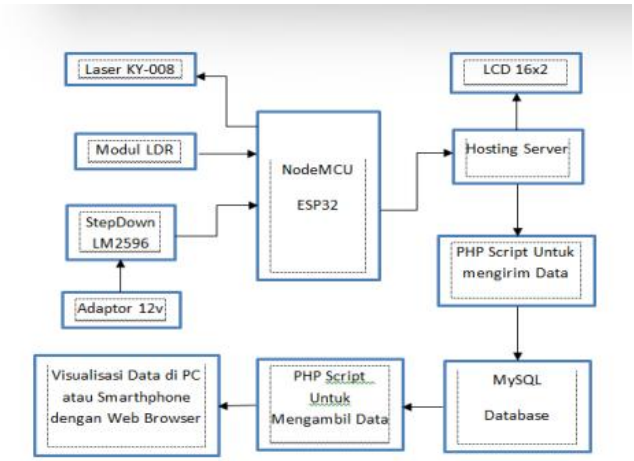


Fig 2. Block Diagram

Information:

1. NodeMCUESP32 gets voltage from a 12v adapter which was previously reduced in voltage using
2. StepDown LM2596 to 3.3 volts, then
3. NodeMCUESP32 sends a signal to the KY-008 Laser,
4. The LDR module will send the signal/data obtained from the KY-008 laser to the NodeMCUESP32,
5. NodeMCUESP32 is looking for a Wifi/Hotspot network to enter the Hosting Server,
6. The 16x2 LCD will display the status that the NodeMCUESP32 is connected to the network.
7. Wifi/Hotspot or not, then the Hosting Server will send the data to the MySQL database using PHP Script,
8. PHP Script will ask for data that has been entered into the MySQL database to be displayed in the Data Visualization on a PC or smartphone using a Web Browser.

2.4.2 Software design

The design of the software will be displayed in the form of a flowchart system. A flowchart is a chart that displays the flow of a program or a system procedure that is built. The first stage of this system is by displaying a starting page, then there are start, stop, and reset buttons at the top of the application to start the stopwatch/time, then there is a form to fill in Name, Age, and Npm to complete the data which will later be entered into the database, then there is a button to Add Data, Show Graph, and Reset Data, The purpose for the Add Data button is to send the student identity, the sit up results and the status obtained will be saved into the database, then the show graph button to see the comparison between students and the sit up results obtained, then the Reset Data button is useful for resetting the sit up data results and status in the database so that it becomes empty again.

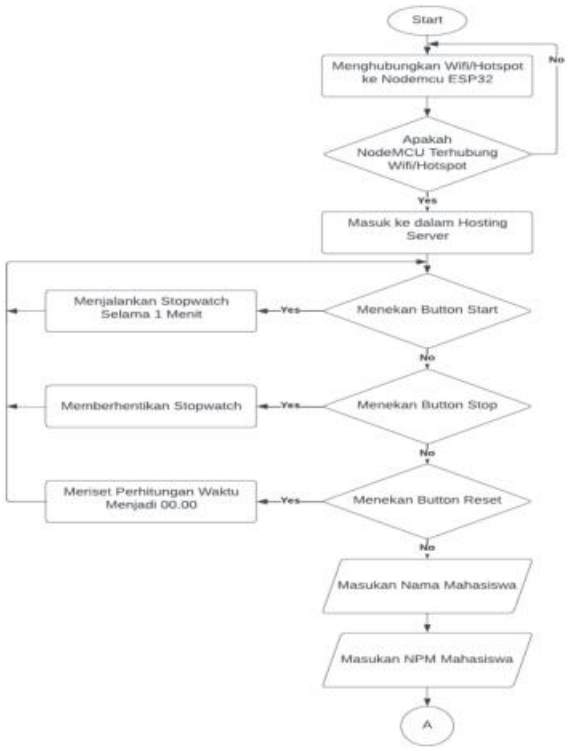


Fig 3. Flowchart Diagram

Information:

1. "Connecting Wifi/Hotspot to NodeMCU ESP32", then
2. Nodemcu will check the system "whether NodeMCU Got Wifi/Hotspot", if it is connected, it will proceed to the next process and if not, it will check again from the beginning,
3. next "Logging into Server Hosting",
4. then "Press Button Start", if yes then the stopwatch will run,
5. then "Press the Stop button", if yes then the stopwatch will stop,
6. then "Press the Reset button", if yes the stopwatch will reset the count and return to 00:00, 7. then there is a form that must be filled out to complete the identity of "Student Name Input, Student Npm Input, and Student Age Input",
7. then "the number of sit ups and status will appear in the halama web server",
8. then there is a selection of the button "Press the Add Data button", if yes, the identity data that has been filled in will be stored in the database as well as the total results of the sit up and status that have been done for 1 minute,
9. then "Press the Graph button", if yes, it will enter a new page containing data on the results of the entire student that has been saved into the MySQL database in the form of a graph,
10. then "Press the Reset Data button", if yes, then the sit up value and status in the display will be reset to 0 and there is no data, and if not, it will display the overall student result data that has been saved into the MySQL database in the form of a tabble. That's the process of the iot device implementation system for testing and measuring muscle endurance sit-up tests.

3 Results and Discussion

3.1 Discussion

This chapter explains the advanced stage after the design process in this study. This chapter discusses the process of making an LCD application system, KY-008 Sensor and LDR sensor module in the measurement of muscle endurance of the sit up test which can be accessed via mobile phone/computer. At this stage from the beginning to the end, which is in the form of tool construction and system coding based on the design that has been designed in the design process, testing the tool in accordance with what has been made and explained in the previous chapter, as well as analyzing the results carried out based on the test results obtained.

3.2 Hardware Design

The construction of the device is a stage of the process of making muscle endurance measurements for the sit up test with ESP32 and Android/Computer. The hardware in this system is in the form of components that are built into a series of systems that can be integrated which are built into a series of systems that can be integrated using the Arduino Uno Programming language and Website Programming which can function properly and can be controlled through Android/Computer. The system is made using the tools and materials that have been provided, namely microcontrollers and other supporting devices. In this process, the system is made with several changes from the initial design made with the aim of obtaining maximum results. In the development of this system, there are several hardware including ESP32, 16x2 LCD, LM2596 Stepdown, LDR Sensor Module, and KY-008 Laser Sensor. These components are arranged in such a small box that they are the brain storage of the entire system that gives commands to the computers connected to the NodeMCU. By implementing the Internet of Things (IoT) which sends data to databases and websites.

3.3 System Coding

System coding is an important process in the formation of the sit up test calculation system in this study, so that this system can run according to its function, programming is carried out on the components that have been assembled and website development as an interface to be used. In system coding, hardware programming is carried out using NodeMCU and application programming using a website, and connected to the MySQL database as a data storage medium obtained by the tool.

3.4 Hardware Programming

The hardware programming used is NodeMCU so that NodeMCU can work to control the system created in this study. The programming of this microcontroller is carried out after the assembly of all system components is completed by showing the functions of the sensors and accreditors used and the connections to be connected. An explanation of some parts of the program code in microcontroller programming can be seen from the following explanation. Add a library that will be used with the include command so that the program can perform its functions such as to define each of the fic and pin variables of the Laser Module and the LDR Sensor Module.

```
const int Laser1 = 12;
const int Laser2 = 14;
```

Fig 4. Introduction of KY-008 laser module

```
const int LDR1 = 25;
const int LDR2 = 34;
```

Fig 5. LDR Sensor Module Initiation

Includes the Wifi and HTTPClient libraries, which are used to connect the ESP32 to Wifi/Hotspot and make GET, POST, and PUT HTTP requests.

```
#include <WiFi.h>
#include <HTTPClient.h>
```

Fig 6. Library ESP 32

Inputs an LCD library, which is used to display the output in the form of words issued by the ESP32.

```
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27,16,2);
```

Fig 7. Library LCD

Create Wifi/Hotspot initialization (SSID,PASSWORD) to connect the ESP32 to connect to the webserver.

```
const char* ssid = "rio";
const char* pass = "1234567890";
```

Fig 8. Wifi/Hotspot Initialization

Enter the host/server address used to connect the ESP32 with the webserver so that the data obtained will be sent to the database.

```
const char* host = "webpsitup.000webhostapp.com";
```

Fig 9. Address

Creating a script is used to make the LDR pin used as an input (input), and make the Laser pin used as an output (output), then in the initial condition the Laser will have a value of HIGH (on).

```
pinMode(LDR1, INPUT);
pinMode(LDR2, INPUT);
pinMode(LDR3, INPUT);
pinMode(LDR4, INPUT);

pinMode(L1, OUTPUT);
pinMode(L2, OUTPUT);
pinMode(L3, OUTPUT);
pinMode(L4, OUTPUT);

digitalWrite(L1, HIGH);
digitalWrite(L2, HIGH);
digitalWrite(L3, HIGH);
digitalWrite(L4, HIGH);
```

Fig 10. Declaring the Sensor Pin

Create a script that is used to declare a new variable of type int (integer), which will hold the reading on the LDR pin via a call to the digitalWrite(pinLDR) function.

```
int in1 = digitalRead(LDR1);
int in2 = digitalRead(LDR2);
int in3 = digitalRead(LDR3);
int in4 = digitalRead(LDR4);
```

Fig 11. Creating a New Container Variable

3.5 Interface creation

The interface has a function as a link between the sit up counting tool and the webserver which makes it easier to store data in the sit up counting system in the MySQL database that has been created in this study.

3.6 Tool testing

The testing stage is a stage that is carried out to facilitate and improve the system by paying attention to whether the sit up counting system can function properly or not. This test was carried out to test several scenarios that had been designed in the previous chapter that focused on the examination and observation of fungi from the proposed system. At this stage, the author carried out a sit up calculation carried out on 6 students of the Indonesian Technocrat University, in this test the tool functioned properly and the status of the number of sit ups was in accordance with the norms of the sit up test for the age of 19 – 25 years.

The results of the trial from several students of the Indonesian Technocrat University:

Table 3. Results of Tool Trials

No	Tester Name	NPM	Age	Number of Sit Ups	Condition	Time	Success
1	Danu Francisco Permana	18316065	23	29	Good	1 Minute	100 %
2	Heru Destria Rahman	18316043	24	22	Enough	1 minute	100 %
3	Andi Gunawan	18316005	23	14	Bad	1 minute	100%
4	Aditya Chaputra	21312089	21	21	Bad	1 minute	100%
5	Adib Ulinuha El Majid	21312089	21	35	Good	1 minute	100%
6	Desi Wulanda ri	20311097	20	8	Bad	1 minute	100%

3.7 KY sensor testing

Testing on the LDR Sensor Module can detect the movement of the sit up, namely the light beam on the KY-008 Laser Sensor is decided by the movement of the sit up, and the LDR Module Sensor does not get the light beam produced by the KY-008 Laser. The LDR Sensor Module and the KY-008 Laser Sensor are located at the top and bottom when doing the sit Up.

3.8 ESP32 sensor testing

The transmission of data obtained from the LDR Module Sensor to the Web is done by connecting it to the ESP32. The ESP32 test was carried out to determine whether the ESP32 contained in the device can connect to the Wifi/Hotspot network or not. This test was carried out by sending data from the ESP32 to the Web and received by responders.

3.9 Web Data Testing

Data testing on the Web is evidenced by the success of the existing data database entered into the web in accordance with the data entered in the database and the menus on the web can be used properly according to the functions in the program.

3.10 Web Testing

This test was carried out by ensuring that the Web designed to display the muscle endurance measurement data of the sit up test can carry out its function, namely to be able to display information in the form of user identity and the acquisition of sit up results obtained from the ESP32.

3.11 KY-008 Laser Pin Series and LDR Sensor Module

used to detect movement in the sit up. The image can be seen in the picture below:

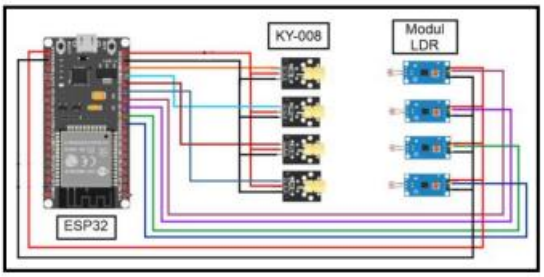


Fig 12. KY-008 Laser Pin Series and LDR Sensor Module

Based on the image above, there are 4 KY-008 Sensors and 4 LDR Module Sensors then connected to the pins in the ESP32.

Table 4. Laser Battery KY-008

Laser Battery KY-008 (1)	Laser Battery KY-008 (2)	Laser Battery KY-008 (3)	Laser Battery KY-008 (4)	ESP32 Battery
DATA	DATA	DATA	DATA	GPIO 15
				GIOP 2
				GIOP 4
				GIOP 32
VCC	VCC	VCC	VCC	WINE
GND	GND	GND	GND	GND

Based on table 4.2 explanation of Sensor KY_008 pins, the data pin is connected to the Digital Input Output pin in the ESP32, then the VCC pin is connected to the VIN pin in the ESP32, and the GND (Ground) pin is connected to the GND (Ground) pin in the ESP32.

3.12 Power Supply Pin Circuit and Configuration and LM2596

The power supply pin configuration of the used to provide voltage to the ESP32 and other devices. The image can be seen in the picture below:

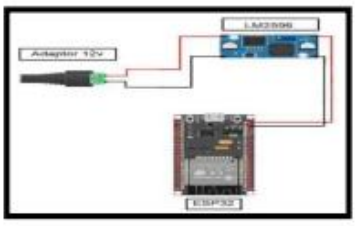


Fig 13. Power Supply Range

Based on the image above, there is a power input in the form of a 12v adapter then connected to the StepDown LM2596 used to lower the voltage from the adapter to 5v, then the output from the StepDown LM2596 is connected to the VIN and GND pins in the ESP32.

Table 5. Power Supply Pin

12 V Adapter Power Supply	Pin stepdown LM2596	ESP32 Battery
Power 12 V	VIN+>VOUT+	WINE
GND	WINE->VOUT-	GND

Based on table 4.4 of the explanation of the power supply in the form of a 12v adapter, the 12v power pin is connected to the VIN + pin, then the GND pin on the adapter is connected to the VIN - pin, then the VOUT + pin on the StepDown LM2596 is connected to the VIN pin on the ESP32, and the VOUT pin – on the StepDown LM2596 is connected to the GND pin on the ESP3.

Fig 14. Arduino IDE Coding

Based on the image above in coding this hardware using the Arduino IDE application, in this application all the conditions and initialization of the tool are carried out.

3.13 System Testing

Testing of this system is carried out to find out whether the design of the system runs according to the desired, the following are the test results of the system, which is made in the form of a table.

Table 6. Test Table

No	Scenario	Expected results	Test Results
1.	Connecting the 12v Adapter to the Stepdown LM2596	LM2596n successfully turned on	Succeed
2.	Connecting the LM2596 Stepdown to the ESP32	The ESP32 was successfully powered on with an output power from the LM2596 of 5v	Succeed
3.	Connecting the ESP32 to the LDR Sensor Module	LDR Sensor Module successfully turned on	Succeed
4.	Connecting the ESP32 to the KY-008 Laser Sensor	The KY-008 Laser Sensor was successfully turned on	Succeed
5.	Connecting the ESP32 to Wifi/Hotspot	ESP32 successfully connects to Wifi/Hotspot and logs into Webserver	Succeed
6.	Displaying the Earned sit up on the *Website*	The results of the sit Up can be displayed on the *Website interface*	Succeed
7.	Pressing the Start Button on the *Website*	Time Counting on *the* Website Running	Succeed
8.	Pressing the Stop Button On the website	Time Counting on Website stops	Succeed
9.	Pressing the Reset Button on the *Website*	Time Calculation on the Research Website to 00.00	Succeed
10.	Entering Your Name on the *Website*	Can fill in the Name Form on the *Website*	Succeed
11.	Entering NPM on *the Website*	You can fill out the NPM on the NPM Form on the *Website*	Succeed

12.	Entering Age on the *Website*	You can fill in the Age Form on the *Website*	Succeed
13.	Pressing the Add Data Button in *Webite*	Data in the form of Name, NPM,Age, sit Up, and Category Acquisition Entered into the Database and Appeared in the Table	Succeed
14.	Pressing the Data Reset Button on the *Website*	Removing Earned Sit Up and Categories on the *Website*	Succeed
15.	Clicking the garbage icon on the table on the *Website*	Deleting Data in a MySQL Database	Succeed

Based on table 6, there are 17 test scenarios and the results of the test of the hardware and software system built can be explained that the sit up test muscle endurance counting system has obtained success in its overall function and system with the test results Successful. It can be inferred from the whole system that it works and functions as it should.

4 Conclusion

The implementation of IoT devices for sit up counting has been tested in the entire system on the tool and website, the author draws conclusions from several problems, namely :

1. The tool can calculate the sit up when the shoulder part disconnects the light beam produced by the KY-008 Laser Sensor.
2. The system can store the results of the sit up into a database via MySQL.
3. The interface on the website will Displays information in the form of user identity and the number of sits that have been performed.

4. Reference

Arifin Jauhari,. Zulita ,Leni Natalia (2016) ,, Mengenal Lebih Jauh Tentang Perangkat Lunak Arduino IDE " Jakarta.

Darmawan Arif (2021) ,, mengenal apa itu mikrokontroller dan cara penggunaannya ", universitas raharja, (Oktober), p.1.

Imelda (2021, 19 May), Mengenal Internet Data Protokol Internet of Things. Di Akses Pada 4 Maret 2023, Dari https://www.kmtech.id/post/mengenal-internet-data- protokol-untuk-internet-of-things

Mardatila Ani (2021, 30 Januari).penjelasan tentang sit up dan tata cara sit up. Di Akses Pada 3 Maret 2023, Dari https://www.merdeka.com/sumut/sit-up-adalah- olahraga-penguatan-perut-ini-manfaatnya-kln.html

Matodang, Ardiansyah Muhammad (2018) ,, Perancangan Sistem Penghitung Dan Pemilah Buah Otomatis Menggunakan Sensor Laser Dioda Dengan Tampilan PC", Universitas Sumatra Utara, pp.10-25

Nyebarilmu.com.(2017, 26 july). Apa Itu NodeMCU Beserta Contohnya. Diakses pada 3 maret 2023, dari https://www.nyebarilmu.com/apa-itu-module-nodemcu- esp8266/

Putri ,Hanna Alifia (2021) ,, Rancang Bangun Sortir Dan Hitung Lembar Kertas A4 Otomatis Menggunakan Sensor Ldr Dan Aplikasi Blynk". Jurnal Of Energy And Elektrycal Enginering, 2(2), pp.15-30

Sasmoko dani (2017) ,, Implementasi Penerapan Internet Of Things(Iot)Pada Monitoring Infus Menggunakan Esp 8266 Dan Web Untuk Berbagi Data", Manajemen Informatika, Sekolah Tinggi Elektronika dan Komputer Semarang, pp.1-9

Setiawan Rony (2021, 4 Agustus). Fungsi, Jenis, Simbol, dan Contoh Flowchart. Diakses Pada 5 maret 2023, Dari https://www.dicoding.com/blog/flowchart- adalah

Shah (2020, 7 Juni). bagaimana cara penggunaan query database MySQL. Diakses Pada 4 maret 2023, Dari https://www.niagahoster.co.id/blog/apa-itu-query-sql/

Surya Ibnu (2018) ,,Studi Evaluatif Tes Push Up Untuk Pengukuran Daya Tahan Otot Lengan", Universitas Pendidikan Indonesia, (2018), p.1.

Wahyuni ,Dwi wahyuni (2024) ,, Rancang Bangun Prototype Alat Penghitung Jumlah Orang Dalam Antrian Berbasis Esp8266", Seminar Nasional Ilmu Komputer, 2(1), 1-14

Reza Fahrisi, M. and Fatoni (2018) „Rancang Bangun Sistem Smart GardenBerbasis Mikrokontroler Menggunakan Metode Sdlc", Bina Darma Conference on Computer Science, pp. 119–131. Available at: https://portfolium.com/entry/final-deliverable-for-sdlc.

Rosadi, D., Hardiansyah, L. and Rusdiana, A. (2018) „Pengembangan Teknologi Alat Ukur Push Up Berbasis Microcontroller Dengan Sensor Ultrasonic", Jurnal

Terapan Ilmu Keolahragaan, 3(1), p. 34. Available at: https://doi.org/10.17509/jtikor.v3i1.8064.

Shah, C. (2020) „MySQL", A Hands-On Introduction to Data Science, pp. 187– 206. Available at: https://doi.org/10.1017/9781108560412.008.

Soethama, G.R.R., Silakarma, D. and Wiryanthini, I.A.D. (2016) „Pengaruh Latihan Beban Terhadap Peningkatan Massa Otot Pectoralis Mayor dan BicepsPada Remaja dan Dewasa", Majalah Ilmiah Fisioterapi Indonesia, 2, pp. 52–57. Available at: file:///C:/Users/ASUS/AppData/Local/Temp/22088-1-42987- 1- 10-20160715.pdf.

TALMERA, A.T. (2022) „Rancang Bangun Sistem Monitoring Listrik Menggunakan Esp32 Berbasis Internet Of Things (IoT)", Mahasiswa Teknik Komputer Fakultas Teknologi Informasi Universitas Andalas, (8.5.2017), pp. 2003–2005.