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An Internet of Things-based Automatic Medicine Consumption Reminder Box

Muhammad Fauzan[1], Nina Paramytha[2]
[1,2] Electrical Engineering, Faculty of Science and Technology, Universitas Bina Darma
Jl. Jenderal Ahmad Yani No.3, 9/10 Ulu, Seberang Ulu I District, Palembang City
Email: Fauzanvivo847@gmail.com

ABSTRACT

Because of age or doing too many activities at home, we often forget the obligation to consume routine medications that we should take that should be scheduled and the doses that have been determined. Therefore, the author wants to develop a tool that helps us consume drugs regularly and regularly. The medicine box uses ESP32 to integrate components such as ultrasonic sensors, loadcells, RTC, sound sensors, and ESP32 modules. Ultrasonic sensors are used to open and close the medicine box automatically, loadcell sensors to find out the condition of the rest or weight of the drug in the box, and RTC sensors as a timer to schedule drug consumption set on ESP32 which will send data on drug consumption schedules, sound sensors to find out the location of the medicine box by clapping both hands so that the detector detects sound and sounds the buzzer, ESP32 module as a microcontroller and sender of all programs that will be sent via the user's telegram application drug box.

Keywords: *medicine box, ultrasonic, loadcell, RTC, sound sensor,*

Introduction

Medicine is a necessity that is very much needed as a reliever when sick. Many humans consume drugs regularly because they have diseases that can only subside by consuming drugs from a doctor's prescription [1][2]. Still, not many people who should consume drugs regularly neglect to consume drugs because much work must be done at work or at home[3]. In the problem, the author wants to create a system that will schedule the consumption of drugs with a schedule and medicines that must be consumed [4][5].

To make it easier for someone to remember the regular drug consumption schedule by creating an automatic tool to remind them of drug consumption in the long term so as not to be negligent in consuming drugs that must be consumed regularly and regularly[6][7].

Studies [8] and [9] in "designing arduino uno-based drug schedule consumption reminders" this study to assist a person in consuming the drug[10]. Then the research from [11], and [12][13], which made "increased adherence to taking drugs in [14] " this study was designed for the adherence of T.B. patients in taking drugs [15][16].

The purpose of this study is to create a drug consumption scheduling system that can be monitored using the telegram application by users, helping make a schedule for drug consumption on time and making it easier for someone to consume drugs regularly[17][18].

Research Methods

Planning Tools

In making a tool, the design tool is essential. With the planning that has been carefully prepared, it is hoped that the results obtained will be by expectations and successful and can work smoothly and as expected [19][20]. This process includes all stages ranging from hardware and software planning, component selection, programming, component installation and testing of the tools created [21]. The steps are made into a block diagram which can be seen in figure 1.

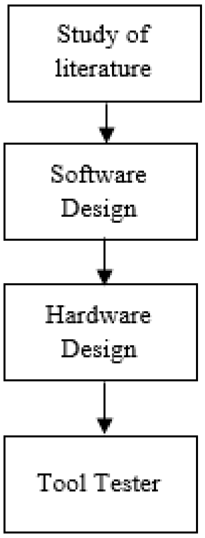

Figure 1 Block Diagram of Research Design

Hardware Tightening

Hardware Design is the design of hardware equipment on the tool. This hardware design begins with making a block diagram of the circuit to know the working system of the device as a whole, starting from inputs, processes, and output. And it is continued with the installation of component components on the tool to the finishing process[22]–[26]. The block diagram of the series "automatic drug box reminder of IOT-based drug consumption schedule" is shown in figure 2.

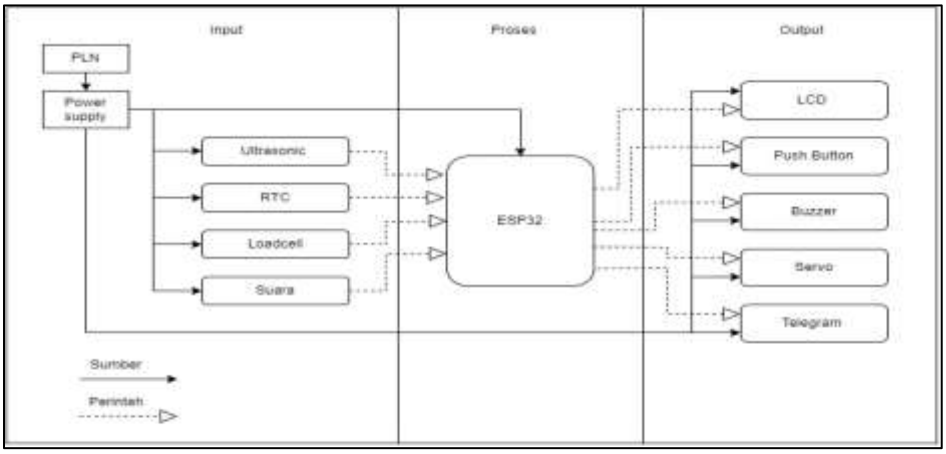

Figure 2 Block Diagram

Series Installation Steps

The steps for designing a series of prototypes of microcontroller-based aquaponics control and monitoring systems, starting from component selection, frame-making and component installation.

1. Power Supply Installation
2. Ultrasonic Mounting
3. Loadcell Installation
4. RTC (Real Time Clock) Pairing
5. Sound Sensor Installation
6. ESP32 Installation
7. Servo Installation
8. 12C LCD Mounting
9. LCD Mounting

How the Tool Works

When the tool is flowed by the mains, it will turn on with the LCD sign on, after which it waits for the connection, and the sensor is ready to work. When the time set is correct, the buzzer will sound, and the system will send a notification to the owner's cellphone. The buzzer will not turn off until the owner opens the medicine box. Ultrasonic sensors will make it easier to open the medicine box because everyone can access it without a card or pin that must be used when opening the package. When the medicine in the box runs out or has run low, the system will send a notification, or it can be checked manually via lcd 16 x 2. and to find out the position of the city when you forget to put the user box, pat both hands two times, the sound sensor will detect and the buzzer will sound. The Full Circuit Scheme is shown in figure 3.

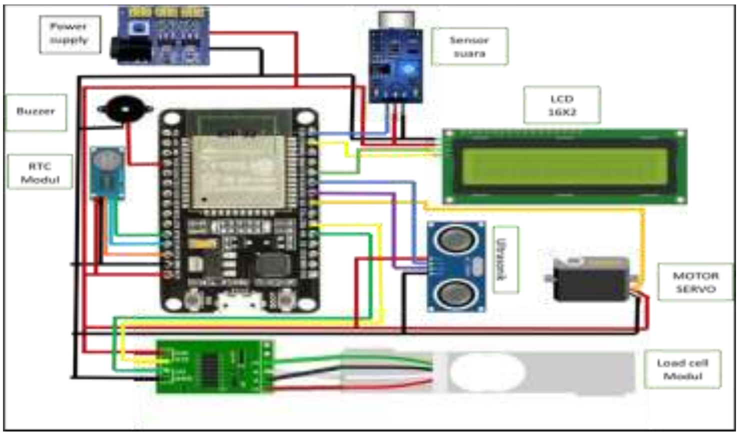

Figure 3 Schematic Circuit

Results and Discussion

Measurement

Measurement aims to find out the incoming voltage and the voltage needed to make it easier to analyze the range, circuit measurement in the form of voltage in the power supply, and voltage of each sensor. Several measurement points will be taken to retrieve the data, so an image is created to make it easier to take measurements.

Measurement Points

Measuring the power supply as the primary source needed to be able to know the voltage before the power supply input until it enters the microcontroller. Several measurement points can be seen in figure 4.

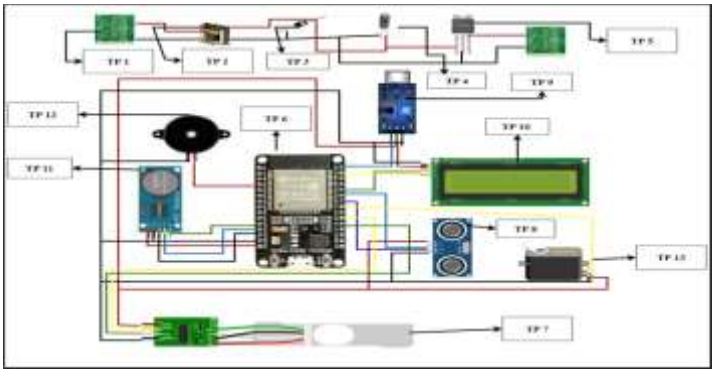

Figure 4 Measurement points

Description of the overall measurement point:

T.P. 1 = The measurement point at the PLN source is the input voltage of the translator
T.P. 2 = Transformer measurement point, calculating the voltage discharged by the transformer
T.P. 3 = Voltage measurement point of the diode on the power supply

T.P. 4 = Voltage measurement point after capacitor on the power supply
T.P. 5 = Voltage measurement point of the regulator that serves as the source of the forward voltage to the microcontroller
TP 6 = Measurement point on ESP32
TP 7 = Measurement point on the loadcell
T.P. 8 = Measurement point in ultrasonic
T.P. 9 = Measurement point on the sound sensor
T.P. 10 = Measurement point on LCD
TP 11 = Measurement point on RTC
TP 12 = Measurement point on the buzzer
T.P. 13 = Servo measurement point

Measurement Results

Measurements at predetermined points were carried out as many as five times to minimize errors and compare the results. You will get an average value by measuring as many as five times.

Table 2 Point measurement results

	Position	Point		Measurement Results						
NO	Measurement	Measurement	Unit	1	2	3	4	5	X	Information
		PLN (TP1)	ACV	222	223	222	224	223	222.8	Transformer Input
		12V Transformer (TP2)	ACV	12,0	12,1	12,1	12,0	12,1	12,06	Diode Input
1	Power Supply	Diodes (TP3)	DCV	12,1	12,1	11,9	12	11,9	12	Capacitor Input
			A	0,61	0,62	0,61	0,62	0,62	0,61	Current
		Capacitors (TP4)	DCV	11,8	11,6	11,6	11,8	11,8	11,72	Input Regulator
		Regulator (TP5)	DCV	4,86	4,85	4,84	4,84	4,85	4,85	ESP32 input
2.	ESP32	(TP6)	DVC	4,93	4,94	4,94	4,95	4,94	4,94	Output ESP32

	Loadcell	(TP7)	DVC	4,94	4,94	4,99	4,97	4,99	4,96	Output Loadcel
4.	Ultrasonic	(TP8)	DVC	4,99	4,99	4,99	4,98	4,98	4,98	Output Ultrasonic
5.	Voice	(TP9)	DVC	4,99	4,99	4,99	4,99	4,99	4,99	Sound output
6.	LCD	(TP10)	DVC	4,99	4,99	4,99	4,99	4,99	4,99	Output LCD
7.	RTC	(TP11)	DVC	4,99	4,99	4,99	4,99	4,99	4,99	Output RTC
8.	Buzzer	(TP12)	DVC	4,99	4,99	4,99	4,99	4,99	4,99	Buzzer output
9.	Servo	(TP13)	DVC	4,99	4,99	4,99	4,99	4,99	4,99	Output Servo

Ultrasonic Process Trials

The trial was carried out by bringing the hand closer to the drug so that everyone could access the medicine box without a password and pin, then get the data results in table 2.

Table 2 Ultrasonic trials

no	experiment	servo response	Servo opening process time	Description on LCD
1.	First, try	Open	4	Taking morning medications
2.	Second try	Open	6	Take afternoon medication
3.	Third try	Open	7	Taking night medications

The ultrasonic test results in table 2 above that the drug box opens automatically when the user brings his hand closer to the ultrasonic. Everyone can access the medicine box without using a password or pin.

RTC Process Trial

The trial is carried out to ensure that at a predetermined time, users will get a notification to their cellphones via the telegram application according to the time of taking medicine. The results of the trial are shown in figure 5.

Figure 5 Telegram RTC notification data

Loadcell Process Trial

This experiment was carried out using drugs as objects that were placed in boxes. The weight of the drug in the package will be displayed on the LCD, and if the drug is almost gone, the telegram will notify the telegram. The results of the trial are shown in figure 6.

Figure 6 Loadcell notification data

Sound Sensor Process Trials

This trial is carried out when you forget to put the medicine box by clapping your hands, the sensor will detect it, and the buzzer will sound. Results Of sound sensor process trials are shown in Table 3.

No.	Voice response	Buzzer response	Detection description
1.	Detect	Live	The existence of the box
2.	Detect	Live	The existence of the box

3.	Detect	Live	The existence of the box

Conclusion

In the measurement of the tool carried out, the error percentage is 0.38%. The rate of errors in the sensor used is 1% then. The device has worked as expected. From the ultrasonic experiments that have been carried out, the servo takes 4 seconds to open the medicine box. From RTC's attempt to limit the time when setting the time, the system will send a notification, and it takes 3 seconds. Testing the loadcell displays on the LCD and sends a notif on the telegram to see the severe state of the drug in a box. Trying the sound sensor when the buzzer sounds interfere with the excellent sensor, making the sensor detect sound and the buzzer always sounds. Write down the conclusions of your paper and further research suggestions in the form of narratives and not in bullet or numeral form.

Checking and experimenting with this system has worked well and according to planning. All components used are in good condition and expected because the output value produced is the same as the measuring instrument used. In this medicine box system, a sound sensor continuously detects the sound from the buzzer, which makes the buzzer challenging to turn off.

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