

# MCU NODE BASED BLOOD GROUP DETECTION EQUIPPED WITH AN AUTOMATIC SAMPLE STIRER

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## Abstract

*Blood type detection tool is a tool that can help In reading blood groups, you can find out the type of group blood with use sensors Light And LED, so in use tool This be equipped Gearboxes as stirrer sample automatic Which Where fluid reagent antisera will stirred with sample blood using the ABO method, results in sensor readings will be displayed on the LCD and also on the application when using Nodes MCU as the microcontroller; based on results testing tool This use 3 person with group blood Which The same on each Blood group samples are A, B, AB, O by comparing groups blood on card identity And results testing Which Where the result can obtained results Which The same. With mark flat flat group blood A is 0.6 and 2.1. As for blood type B, it is 1.7 and 1.1. As for AB blood type is 0.9 and 1.1. And blood type O is 2,3 And 2,3. whereas For mark error Which obtained group blood A that is 0.5 error value for blood group B i.e. 0.5 error value for blood group AB i.e. 0.6, And error value for blood type O namely 0.2.*

**Keywords:** *Group Blood, Module Censorship LDR, Nodes MCU , Mixer Sample, Application.*

## I. Introduction

Blood is internal fluid the body is red and stored in system closed And very important for continuity life man. Blood works For transport oxygen And nutrition to all overbody, Blood also functions to heat the body. Plus, blood plays an important role in fighting disease. (Muhamad Rida et al, 2019).

Group blood is group blood Which classified according to the presence or absence of antibodies and also the presence or absence of antigens in blood cells red. Before taking blood, it is necessary to determine blood type and blood type of the patient so that it can be done with method Which The same. (RIDHA, 2016).

Currently the ABO method is more widely used for examination blood is divided into blood groups A, B, AB, and O. Until now Blood group checks are still carried out with the help of personnel medical Which need truth eye, And etc. on. accuracy information Which

accepted Still low. depends on examiner's eye abilities. Fatigue affects the eyes, so method This not enough useful For blood test big. (RIDHA, 2016).

Inspection group blood ABO done For determine type group blood on man. Determination group blood ABO in general with use method Slides. Method This based on principle reaction between agglutinin (antigen) on surface erythrocytes with agglutinin Which there is in serum/plasma Which form agglutination or lump. Method slides is Wrong One method Which simple, fast and easy way to check blood type. (Anita Octary)

In the previous tool (Ade Murdiansyah, 2011) there are weaknesses in the process of mixing blood samples and reagent liquid which is still carried out by a microcontroller system, the author add stirring sample in a way automatic which use application For keep results from reading tool so that more effective in use

moment do inspection group blood.

## II. Research methodology

By systematic study This method uses an experimental method which is presented in the form of a flow diagram as follows:

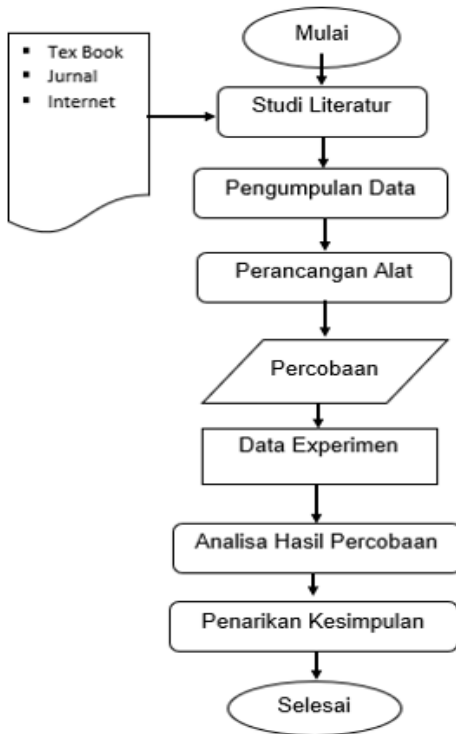


Figure 1. Research Flow Diagram

### Literature Studies

Literature study is a series of activities that are enjoyable to you method collection data References, read And take notes as well as process material study, or series activity For Collect references that are relevant and related to the final assignment. On stage This done collection material References And literature other things needed to support the work of this research. On Carrying out this research, the supporting literature used was obtained from books, journals, final assignment reports, the internet and various other sources like task final Which related with knowledge health And Act Minister of Health Regulation, Which can makes it easier writer in finish study This.

### Collection Data

Collection data Which done researcher that is with identify the material needed in this research by means collect information about the tool material in this research. Information obtained both from various theories and supporting book sources Which can used as material planning.

### Planning Tool

The design of this tool uses the ESP32 Node MCU as the center control. The Gearbox motor will mix the reagent and blood sample, Then Module sensors light LDR And LEDs as input on tool which works detect group blood on sample. results detection the will in show on displays And application in the form of picture.

### Implementation Test

Researcher do taking sample blood on somebody Then the blood type will be detected so that it can be known that the tool has worked well with group comparisons blood on person Which before has is known group his blood.

### conceptual framework

The block diagram for designing this detection tool is:

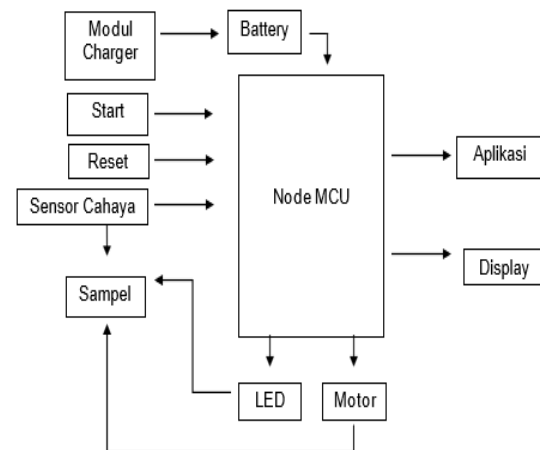


Figure 2. Block diagram of the tool

### Method Work Block Diagram

Module Chargers fill in Power on battery For supplying Node MCU voltage that requires dc voltage, start button pressed For start operation, reset For repeat work process, the motor will stir the samples and reagents sensors useful for detecting blood samples that will be processed

by Nodes MCU, the result will be come on stage on the LCD And Also on Application.  
The flow chart for this tool is as follows:

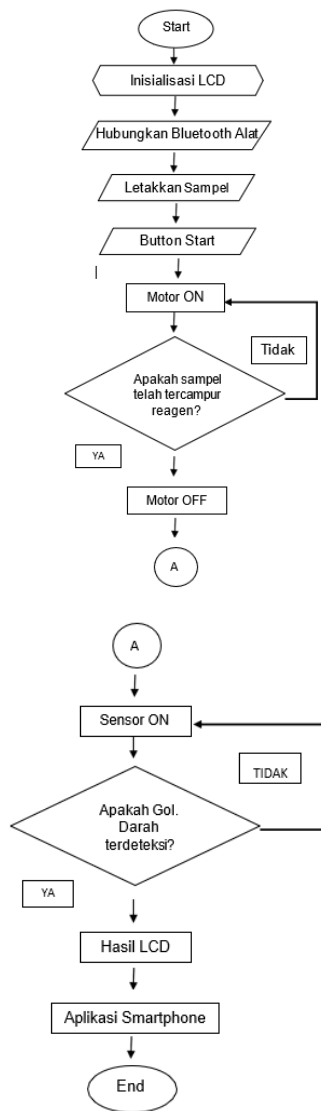


Figure 3. Flow chart of detection tools

Explanation Flow chart:

Process started from start after That start initialization LCD, After that the tool connects the application to the Bluetooth tool, blood samples inserted into a tool that has been given a drop of reagent A liquidand B, press the start button to start the motor stirring process On will mix the reagent fluid and blood sample, Appears question is sample has mixed reagent? If No so motorcycle will Keep going turn And If yes so Motorcycle OFF And sensor On For detect

group blood on sample,after That appeared question is sample detected?, If No sensors Still detects the sample and if yes then the results will appear on the LCD, The reading results will appear in the application in the form of a PNG file after That all work process end tool or finished.

### III. Results and Discussion

Blood tests are usually carried out using the ABO method. On method ABO used antiserum, for example antiserum A And antiserum B. The blood sample is placed on a glass slide antiserum . Antiserum or antigen is used to determine group blood is: blue antiserum A and yellow antiserum B. There are agglutinogens in human blood that causes clotting when diluted with antisera. This happens because the antiserum contains agglutinin. is agglutination agglutinin.

#### Data analysis

- a. Formula Average

$$\bar{X} = \frac{\text{hasil penjumlahan pengukuran}}{n}$$

- b. Error Formula (error)

$$\text{Error \%} = \frac{\bar{y} - X}{Y} \times 100\%$$

#### 1. Results Testing Sample Blood

Blood sample testing was carried out on 12 people with the following results:

Table 1. Blood Sample Test Results

No	Nama Pasien	Jenis Golongan Darah	
		Uji Manual	Uji Alat
1.	Fadil	A	A
2.	Ruslan	A	A
3.	Ahmad	A	A
4.	Hijrah	B	B
5.	Faras	B	B
6.	Firman	B	B
7.	Alvin	AB	AB
8.	Ibnu	AB	AB
9.	Arif	AB	AB
10.	Paisal	O	O
11.	Miftah	O	O
12.	Arneston	O	O

**2. LDR Sensor Voltage Output Measurement Results**

Table 2. Measurement of output voltage on the LDR sensor

No.	Nama Pasien	Sebelum Antisera		Sesudah Antisera	
		Anti A	Anti B	Anti A	Anti B
1.	Fadil (A)	3,2V	3,2V	0,6V	2V
2.	Ruslan (A)	3,2V	3,2V	0,8V	2,4V
3.	Ahmad (A)	3,2V	3,2V	0,6V	1,8V
4.	Hijrah (B)	3,2V	3,2V	1,8V	1,1V
5.	Faras (B)	3,2V	3,2V	1,6V	1,1V
6.	Firman (B)	3,2V	3,2V	1,8V	1V
7.	Alvin (AB)	3,2V	3,2V	1,2V	1V
8.	Ibnu (AB)	3,2V	3,2V	0,9V	1,2V
9.	Arif (AB)	3,2V	3,2V	0,6V	1V
10.	Paisal (O)	3,2V	3,2V	2,3V	2,2V
11.	Miftah (O)	3,2V	3,2V	2,4V	2,4V
12.	Arneston (O)	3,2V	3,2V	2,2V	2,4V

**3 Measurement Results Average Output Voltage on the LDR Sensor**

Table 3. Average output voltage measurements on the LDR sensor

No.	Golongan Darah	Nilai Rata-rata	
		Anti A	Anti B
1.	A	0,6	2,1
2.	B	1,7	1,1
3.	AB	0,9	1,1
4.	O	2,3	2,3

In table 3, it can be seen that if blood type A for anti-reagent A the result is 0.6 which is a lower result from anti-reagent B, the result is 2.1. As for groups blood B on anti-reagent A, the result was 1.7, which was more tall from anti reagent B Which the result is 1.1. As for For blood type AB on anti-reagent A the result is 0.9 Where almost The same with results from

reagent B that is 1.1. And ForBlood type O on anti-reagent A results is 2.3 Where The same with results from anti reagent B that is 2,3 Also.

**4. Results Measurement Outputs Gearboxes**

Measurement The output value that has been measured with this avo meter when the sample has been detected it will be different due to the voltage from power supplies divided in every Suite And motorcycle Which works as an automatic stirrer.

Table 4. Rotational Speed Values from sensor output voltage (Gearbox output)

No.	Tegangan output sensor	Nilai RPM
1.	1 V	33,3 RPM
2.	2 V	67 RPM
3.	3 V	100 RPM
4.	4 V	133,2 RPM
5.	5 V	167 RPM
6.	6 V	200 RPM

On table 4, can seen mark RPM from voltage start from 1V Until 6V. Where on tension 1V produce mark 33.3 RPM. And if the voltage entering the motor gearbox is higher then the value The resulting RPM will also be higher so that the rotation will increase getting faster. And the tool that the author made requires voltage input 3,4 V so that RPM value Which produced is 113.2 RPM.

**System Work On Tool Detector Group Blood Based NodesMCU Be equipped Mixer Auto Sample**

The working system of the design of the group detection tool blood based nodes MCU be equipped stirrer sample automatic. Where the LDR sensor is a series of sensors used on the NodeMCU which has the function of detecting light. Role Suite sensors LDR This very important especially in tool This blood type detector is used to determine the occurrence of agglutination on blood after giving it reagents/antisera.

The function of the motor here is as a sample stirrer blood And reagent so that can

makes it easier officer Laboratory. Big voltage Which used here as big as 5V And 3.3V D.C Whichworks unique activate components so that tool can Work in accordance provision Which has in plan before his.

As for sample Which in use is blood Which new in takefrom the patient's body so that it is more easily detected by sensors and mixing with using reagents/antiser.

The application displays the reading results and saves the reading results on the blood type detection tool in the form of a PNG file which is saved on the cellphone used .



Figure 4. Tool application display



#### IV. Conclusion

Based on results planning, making module, writing and data analysis the author can conclude as follows:

1. Group blood can detected use module sensors light and LED with a gearbox as a sample stirrer

with a rotation speed of 113.2 Rpm

2. During the process, blood sample preparations must be placed parallel with location sensors so that sample blood can detected by the light sensor module and LED where the results will be displayed on the LCD and application. Based on this process, blood sample detection results were obtained that were 99% accurate with the patient's previously known blood type. based on the results of testing this tool using 3 people with the same blood type The same on each sample group blood that is A, B, AB, O by comparing the blood type on the identity card and the test results where the results can be the same. So that get mark flat flat for groups blood A for anti-reagent A the result was 0.6 which was lower than for anti-reagent B whose result was 2.1. As for blood type B, the result for anti-reagent A is 1.7, which is a higher result from anti reagent B Which the result is 1.1. As for For Blood type AB on anti-reagent A results is 0.9 which is almost The same with results from reagent B that is 1.1. And For blood type O, the result for anti-reagent A is 2.3, which is the same as the result for anti-reagent B, namely 2.3. As for mark error Which obtained group blood A that is 0.5, And The error value for blood type B is 0.5, and the error value for blood type AB is 0.6, and the error value for blood type O is 0.2.

#### Confession

Thanks to:

1. Director of the Makassar Muhammadiyah Polytechnic
2. Head of the Makassar Polytechnic Medical Laboratory Technology Study Program

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