The Automatic Rubber Seed Clone Identification Are Presented Using Reflectance Sensor, LDR and PIC

Siti Harishah Binti Azman
Faculty of Electrical Engineering
Universiti Teknologi MARA Malaysia,
40450 Shah Alam, Selangor, Malaysia.
e-mail:harishahazman@yahoo.com

Abstract - **The automatic rubber seed clone identification are presented using Reflectance sensor, LDR and PIC as a controller. The objective of this project is to create an intelligent and automatic identification of rubber seed using application of Microcontroller PIC 16F877A. The functions of this project are to recognize of the selected best rubber three series by using the reflectance at the surface of rubber seed. This project need to identification of five type rubber seed clone. There are RRIM 2020, RRIM 2002, RRIM 2024, RRIM 2015, and RRIM 2023. The LDR are function as a detection of light because the reflectance sensors need the enough light to operate proper to recognize the surface of rubber. The reflectance sensor (QTR-1A) are use to recognize the surface of rubber skin and take the sample of reading. In this project, three of reflectance are use to cover up the surface of rubber skin because the sensor is too small and cannot cover the all surface of rubber skin. These sensors also use to measure the percentage of light reflectance from seed surface. There have two distances measure the rubber seed. There are 6 mm and 1 mm from sensor to rubber seed. The Microsoft Office Excel is use to analyse the average ADC value and the voltage that cover from sensors. All rubber seed clone needs to take 25 sample of reading to do analysis. The analyses are show in TABLE and graph and decided to take the average range as a conclusion to compare the type of every clone.**

Keywords – Reflectance sensor (QTR-1A), PIC, LDR

I. INTRODUCTION

The Malaysia rubber tree has the strength of teak wood. Teak wood is considered one of the strongest trees around. The teak furniture is considered to be the most expensive and the most durable. The sad part about the Malaysia rubber tree is the fact people have not realized its characteristics for a long time. There is a lot of story that goes with the Malaysia rubber tree. The tree had been used to produce latex. Once the tree are not produce latex anymore. The tree needs to be cut and plant the new rubber tree. Right now much furniture is which is made from the wasted or recycled rubber tree. In another word, rubber is the importance economics resource for our county. The government also hired a lot of student to study and improve the quality of rubber tree. In Malaysia have more than 30 clones of rubber tree. The clones are produce from many ways for example from farmers, agriculture, feather and the humidity of this country. Every clone have different pattern on the surface. The different of colour and surface are measure to identify the clone of rubber seed. However, this method will delay the time and the accuracy is of the identification is not accurate. The farmer need to train the new worker to recognize all time seed clone and need to take a long time. Before this the best rubber series clone was recognized based on range of reflectance of wavelength, shape and texture of the rubber series seeds through the image processing and wavelet technique that were introduced by the Muhammad Fauzie et al [1, 2, 3, 4].This project is further improvement than the previous project, and use the reflectance sensor and LDR as a requirement to determine the colour and surface to identify the clone type. The LDR as the sensor for detect the enough light. The enough light is very important to measure the brightness of surface material which reflects the visible light.

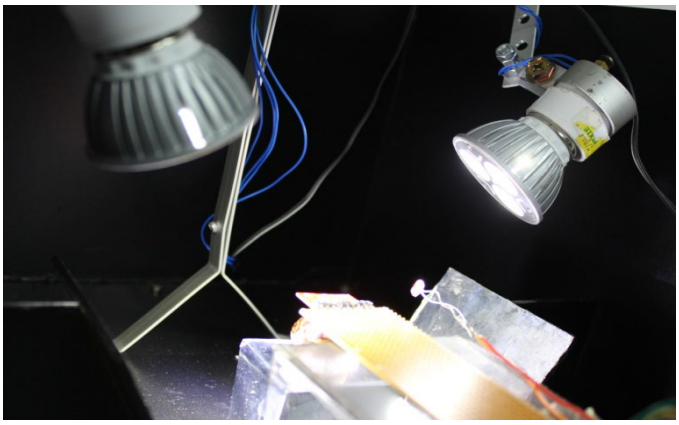

Figure 1. Rubber seed clone identification prototype

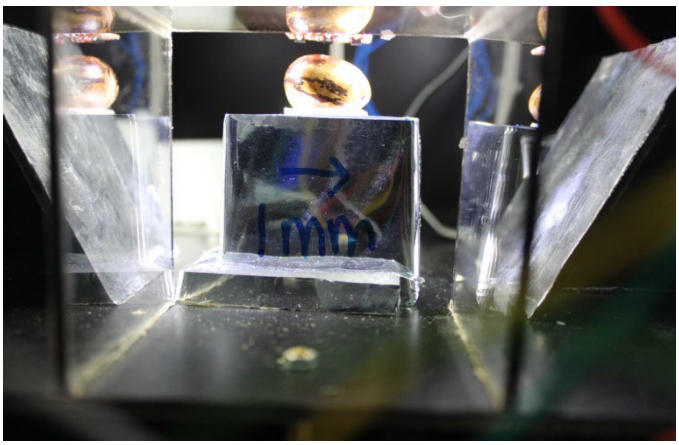

Figure 2. Experiment point

A. Clone characteristic

The figure 3 show the characteristic of every seed clone that used in this experiment.

Figure 3. RRIM 2002

I. RRIM 2002

In medium size, brownish with smooth and shinning seed coat and square shape.

Figure 4. RRIM 2015

II. RRIM 2015
Also in medium size, smooth, shinning with the light brownish seed coat and square to slightly ovoid shape.

Figure 5. RRIM 2020

III. RRIM 2020
Also in medium size, Smooth with light brownish seed coat and square to rectangular shape.

Figure 6. RRIM 2023

IV. RRIM 2023
Large size, slightly rough, dull with light greyish brown seed coat and ellipse shape.

Figure 7. RRIM 2024

V. RRIM 2024
Small size, smooth with light brownish seed coat and almost too circular shape.

II. METHODOLOGY

Methodology part will cover the process which is involved in the development of the automatic rubber seed clone identification are presented. The process involved in the development of the project is very important so that the process is smooth without any difficulties. The processes involved are under constant changes due to unexpected changes or complications.

The methodology about this project have eight steps which is literature review, development of the rubber seed clone identification, programming using PIC, troubleshoot hardware and software, experiment setup, analysis, build programming, troubleshooting and lastly report.

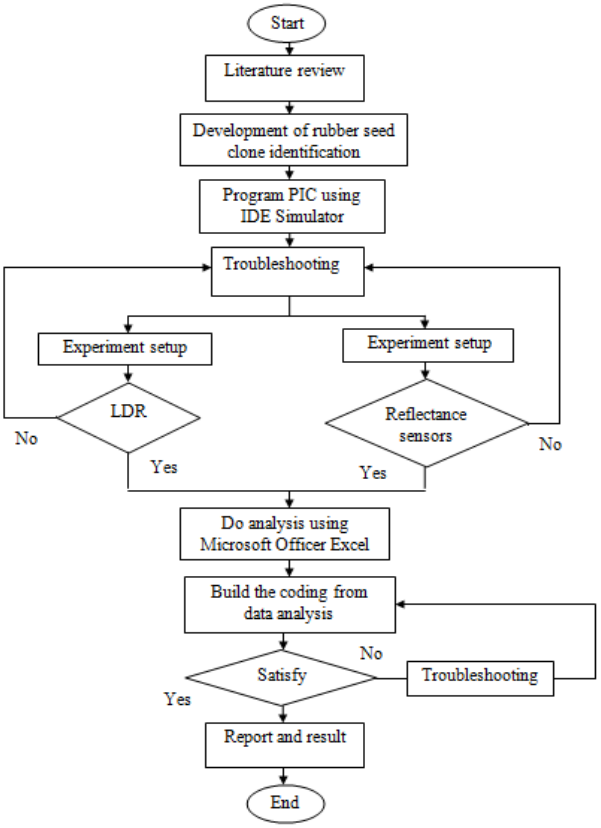

Figure 8. Overview of the project (Flowchart)

The literature review was gain by several knowledge which through the Rubber Research Institute of Malaysia, journal, and rubber inspector. For the development of the rubber seed clone identification, the circuit was design by ORCAD, SK 40 and in the microcontroller was using PIC 16F788A. The process of troubleshooting must do if it have problem when development and do the software programming. This project is use four sensors which are one LDR and tree reflectance. For the enough lighting it's depending on LDR. If not enough light the PIC do not continue the process flow. For the reflectance sensor are determine the value of colour and shape. Every colour and shape is main factor to produce the different ADC value and determine the type of seed clone. They need to take the average of 25 of seed for every clone. Get the data and analysis will be the last part for see the best result and differentiate between theoretical and practical results.

A. Hardware system design

In this part, the basic component are requirement is the tree reflectance sensor and one LDR as an input PIC Microcontroller, the PIC Microcontroller as controller to produce ADC value and the lastly is the LCD display to show the result

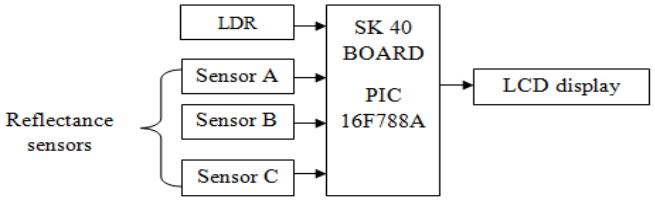

Figure 9. Automatic rubber seed identification system structure diagram

The hardware is start by using power supply from USB port pc and the PIC 16F877A will start operates by detection of the ADC signal from LDR either the light enough or not. If not detect the system will not continue the operation. After the light detection, the sensor A, sensor B, and sensor C will operate and the output of sensor as a input of PIC 16F788A. The output of PIC 16F77A is an ADC value and they have 5 range value of ADC are converted to voltage then the LCD will display the result.

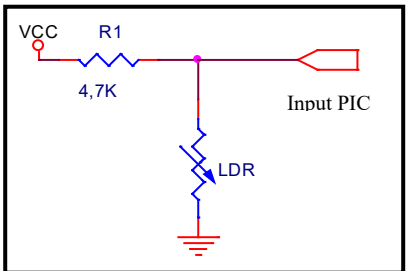

Figure 10. Schematic diagram of LDR.

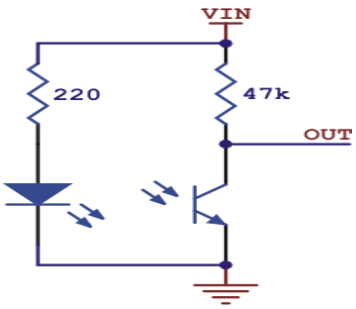

Figure 11. Schematic diagram of reflectance sensor

B. Software system

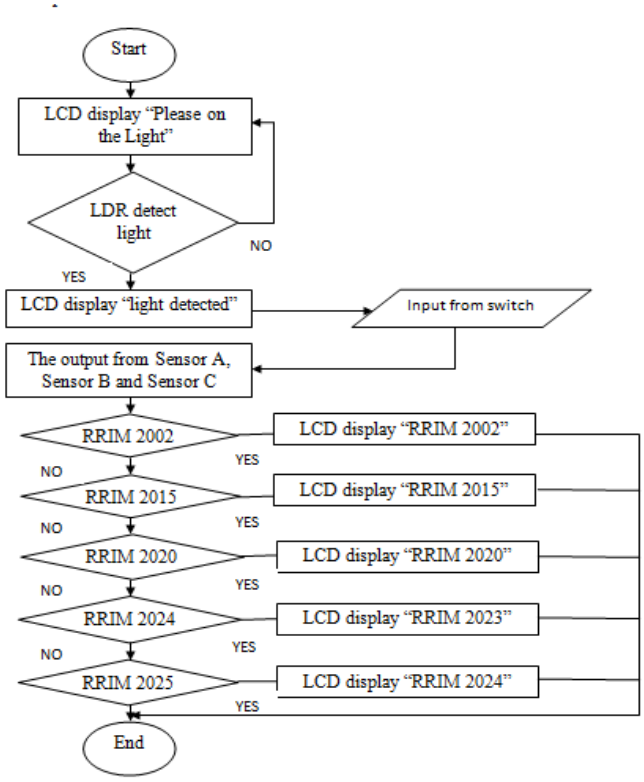

Figure 12. Flow chart of the Automatic Rubber Seed Clone Identification

This project is using IDE Simulation as software for programming the PIC microcontroller. The voltage to on the PIC is 5 v either from adepter or USB port pc. In this project the pin mode A0, A1, A2 as input port for reflectance sensors. The A3 as a input port for LDR. The output is use for display LCD is the port B and port D. In this project are using combinations of analog and digital input to measure the rubber seeds. This means for the reflectance sensor it using analog input to measure and decided the clone of rubber seed. For LDR is using the analog to digital also for the comparison of voltage. That means for the enough light source. The software system in this project consists of five conditions which is RRIM 2002, RRIM 2015, RRIM 2020, RRIM 2023, and lastly RRIM 2024. These conditions also have 2 distances. There are 6 mm and 1 mm. The distances are decided using switch. There are switch1 and switch2. Then they loop as a required.

III. RESULTS AND DISCUSSION

The resistance of the LDR gets smaller when there have lighting is increases. The resistance of the LDR should be low. For the QTR-1A reflectance sensor carries a single infrared LED and phototransistor pair. The phototransistor is connected to a pull-up resistor to form a voltage divider that produces an analog voltage output between 0 V to 5. Lower output voltage is an indication of greater reflection.

A. RRIM 2002

The figures below are showing the data analysis for 25 of seed clone to determine the average of voltage for this type. There is have 2 distance of clone, there are 1 mm and 6 mm. Every seed are measurement by 3 sensors. There are Sensor A, Sensor B, and Sensor C.

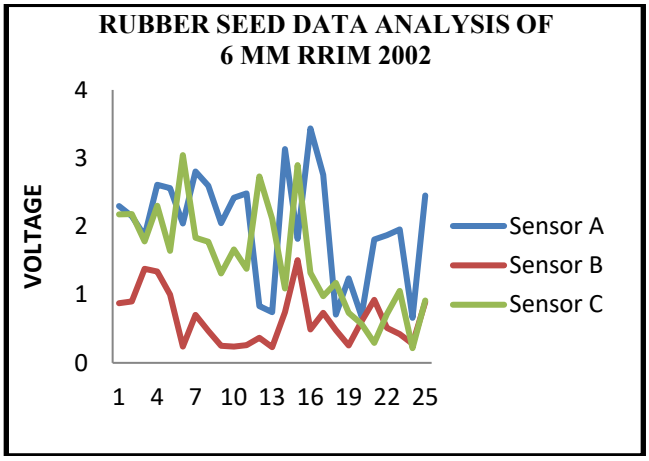

Figure 13. RRIM 2002 in 6 mm

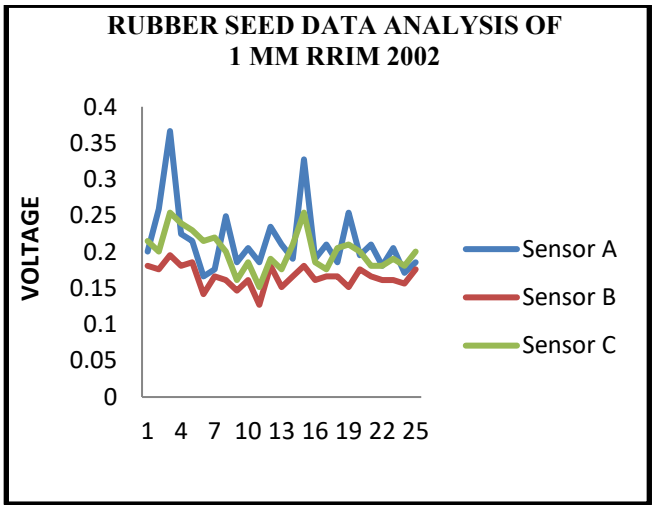

Figure 14. RRIM 2002 in 1 mm

B. RRIM 2015

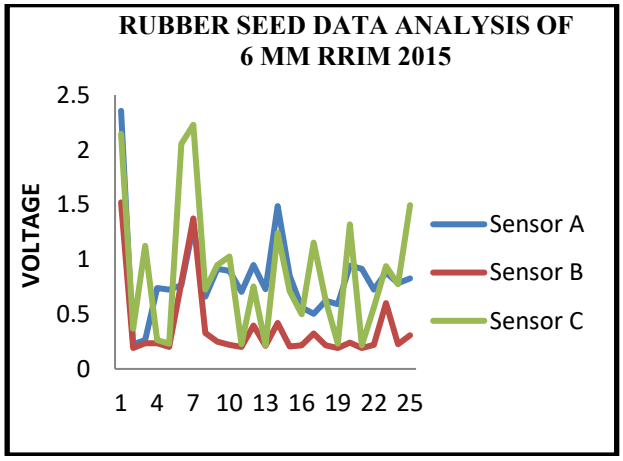

Figure 15. RRIM 2015 in 6 mm

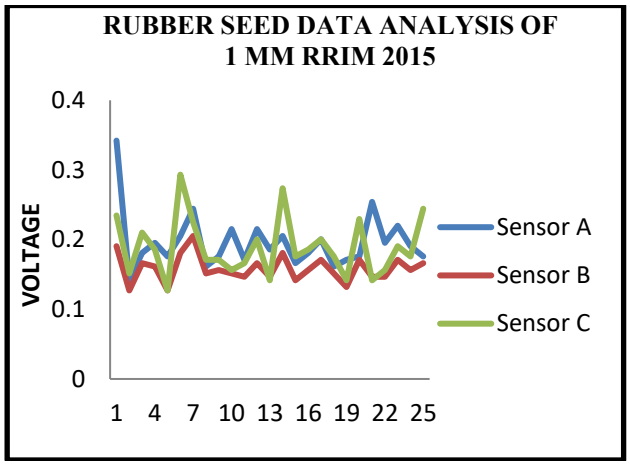

Figure 16. RRIM 2015 in 1 mm

C. RRIM 2020

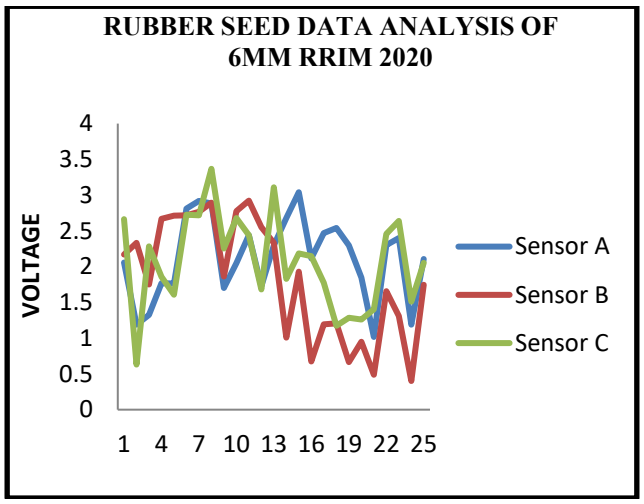

Figure 17. RRIM 2020 in 6 mm

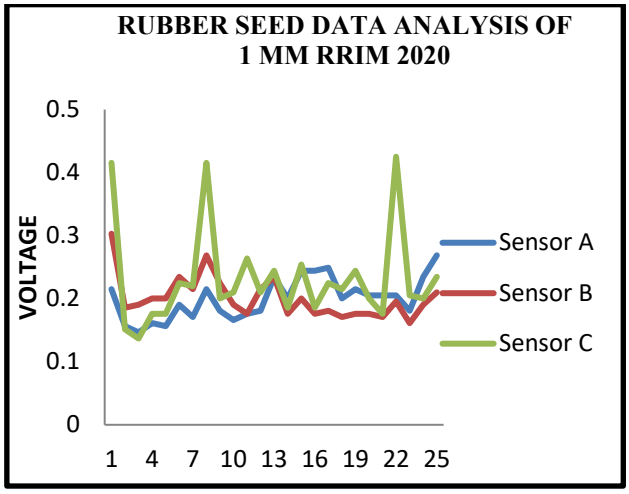

Figure 18. RRIM 2020 in 1 mm

D. RRIM 2023

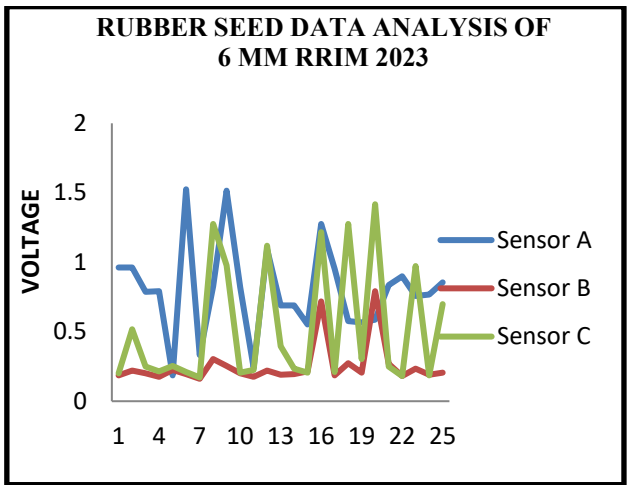

Figure 19. RRIM 2023 in 6 mm

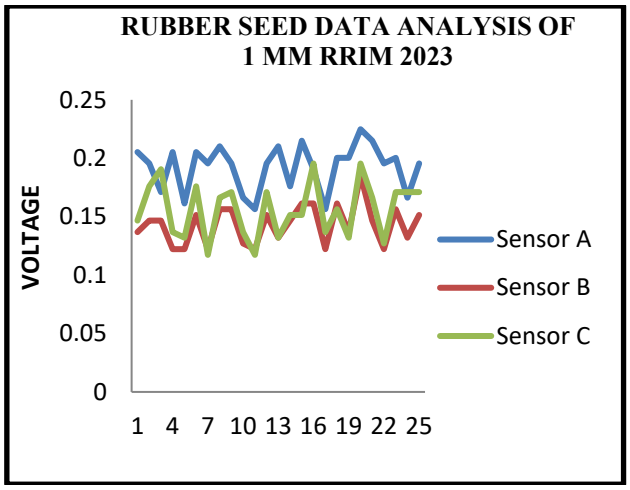

Figure 20. RRIM 2023 in 1 mm

E. RRIM 2024

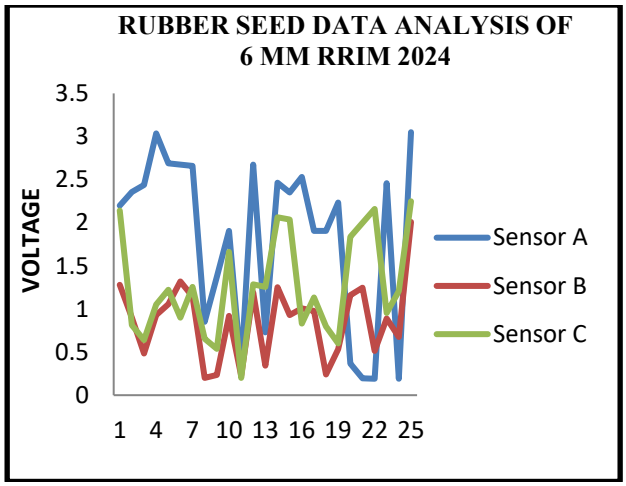

Figure 21. RRIM 2024 in 6 mm

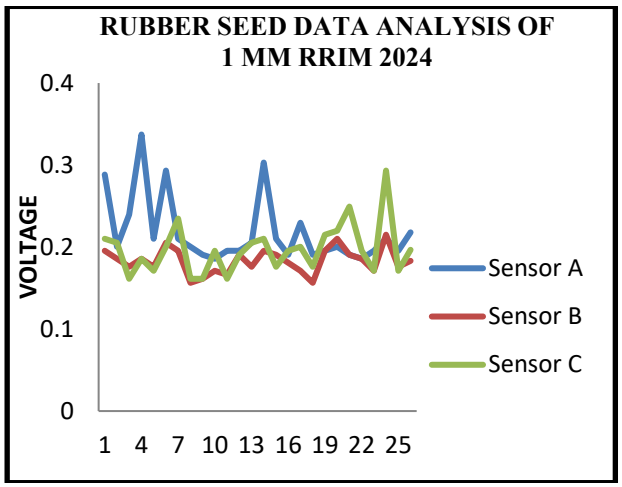

Figure 22. RRIM 2024 in 1 mm

These experiments are performed to collect frequencies of wavelength that have been reflected. In orders to records the necessary range of average voltages, all the possibilities had taken.

TABLE 1. AVERAGE VOLTAGE IN 6 mm

Clone	Average 6 mm		
	Sensor A	Sensor B	Sensor C
RRIM 2002	1.998827	0.643402	1.515152
RRIM 2015	0.83597263	0.37986315	0.88250244
RRIM 2020	2.117107	1.827175	2.069208
RRIM 2023	0.80195503	0.25493646	0.52668622
RRIM 2024	1.82932551	0.86608016	1.25943304

TABLE 2. AVERAGE VOLTAGE IN 1 mm

Clone	Average 1 mm		
	Sensor A	Sensor B	Sensor C
RRIM 2002	0.21544477	0.1657869	0.20058651
RRIM 2015	0.19628543	0.15874878	0.18905181
RRIM 2020	0.200196	0.200978	0.231867
RRIM 2023	0.19237537	0.1431085	0.15581623
RRIM 2024	0.21798631	0.18318671	0.19667644

Figures below show the different graphs plotted on the difference of voltage reading for 5 clones taken from tree different sensors, namely Sensor A, Sensor B, Sensor C.

F. SENSOR A

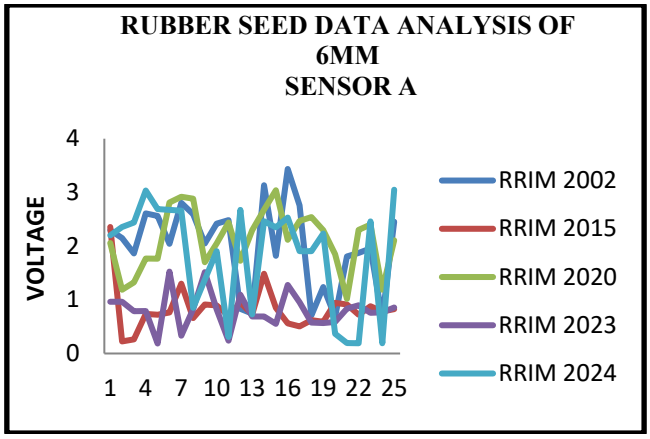

Figure 23. Sensor A in 6 mm

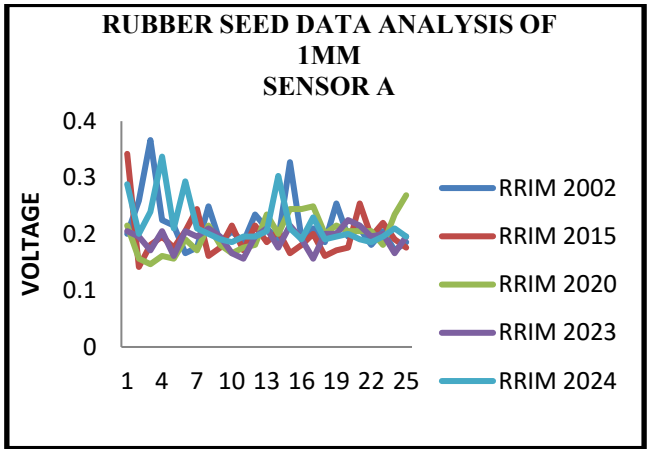

Figure 24. Sensor A in 1 mm

G. SENSOR B

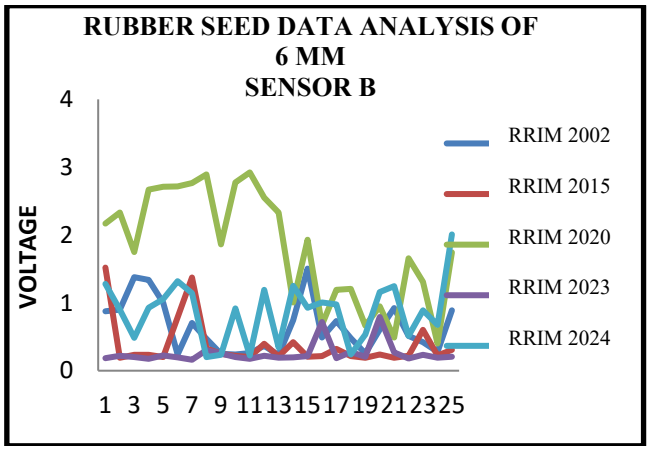

Figure 25. Sensor B in 6 mm

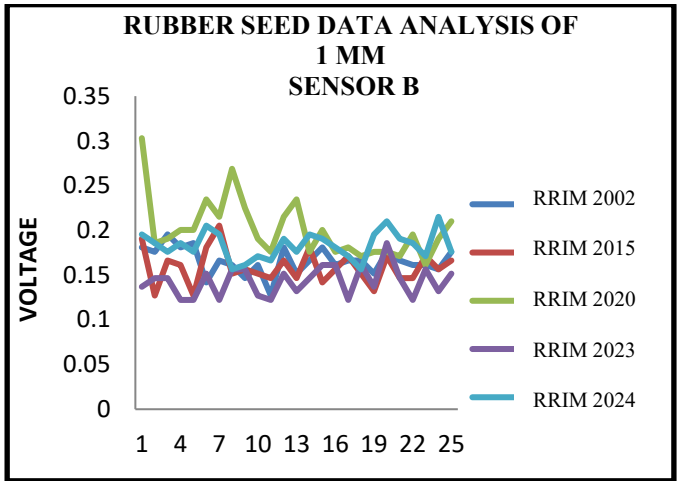

Figure 26. Sensor B in 1 mm

H. SENSOR C

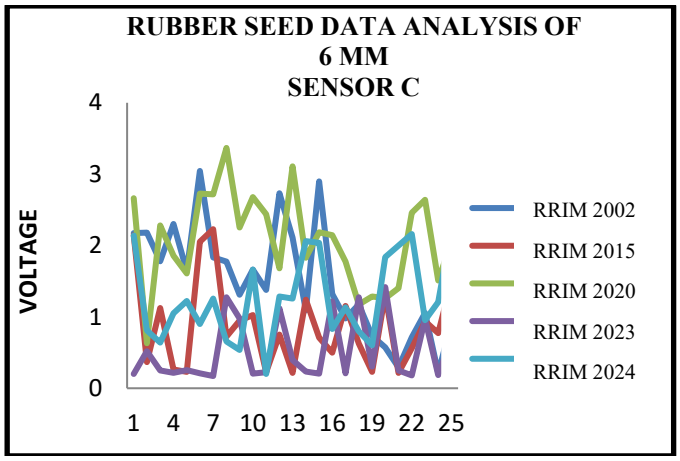

Figure 27. Sensor C in 6 mm

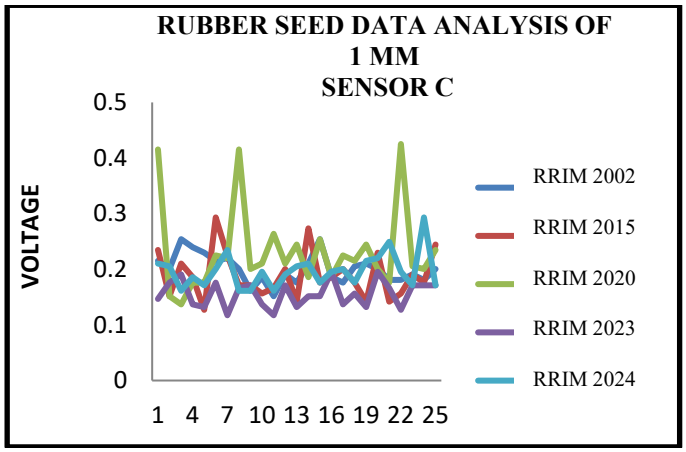

Figure 28. Sensor C in 1 mm

The tables below is use for program data for PIC. The ranges of ADC value are based on the each sensor.

TABLE 3. SENSOR A MEASUREMENT 6 mm

No	Clone Sensor A (6 mm)	Range(ADC)
1	RRIM 2002	322-510
2	RRIM 2015	215-539
3	RRIM 2020	223-379
4	RRIM 2023	130-338
5	RRIM 2024	233-598

TABLE 4. SENSOR B MEASUREMENT 6 mm

No	Clone Sensor B (6 mm)	Range(ADC)
1	RRIM 2002	186-359
2	RRIM 2015	211-330
3	RRIM 2020	40-171
4	RRIM 2023	40-142
5	RRIM 2024	75-411

TABLE5. SENSOR C MEASUREMENT 6 mm

No	Clone Sensor C (6 mm)	Range(ADC)
1	RRIM 2002	438-597
2	RRIM 2015	376-461
3	RRIM 2020	138-449
4	RRIM 2023	226-420
5	RRIM 2024	295-561

TABLE 6. SENSOR A MEASUREMENT 1 mm

No	Clone Sensor A (1 mm)	Range(ADC)
1	RRIM 2002	37-127
2	RRIM 2015	32-44
3	RRIM 2020	35-50
4	RRIM 2023	30-36
5	RRIM 2024	33-155

TABLE 7. SENSOR B MEASUREMENT 1 mm

No	Clone Sensor B (1 mm)	Range(ADC)
1	RRIM 2002	30-37
2	RRIM 2015	27-34
3	RRIM 2020	25-35
4	RRIM 2023	24-29
5	RRIM 2024	31-38

TABLE 8. SENSOR C MEASUREMENT 1 mm

No	Clone Sensor C (1 mm)	Range(ADC)
1	RRIM 2002	43-132
2	RRIM 2015	27-39
3	RRIM 2020	27-43
4	RRIM 2023	26-34
5	RRIM 2024	29-46

Figure 29. The result of clone display

IV. CONCLUSION

In conclusion objective of this project is achieving that is to know how to identify circuit problems and identify best method to solve the problem to design rubber seed identification. Also that, the distance also need to be measured for the precision and this project the distance of 6 mm is more accurate. Other than that, from this project student can learn how to design a circuit by using ORCAD Software, how to analyse the circuit and how to convert the circuit to printed circuit board (PCB). In addition, from this project drilling and soldering technique can been improved. Furthermore, to design an automatic rubber seed identification based on reflectance has been successfully build and implemented.

V. RECOMMENDATION

There are several recommendation can be apply to In order to upgrade this project, other sensors in terms of the weights, shapes, and sizes can be used instead of the reflectance sensor. This is because the every type of rubber clone have the own size, shape and weight. Construct a fixed box measurer to obtain an accurate stability from the rubber seed.So, in future this project are more shape and intelligent. Because of the nature of the reflectance sensor which is very small thus it cannot cover the surface of rubber seed. Hence, we need to add at least one or more sensors to the PCB board.

ACKNOWLEDGMENT

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