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FOREWORD BY DR. NURBAITI WAHID
KPP PKE UITMCTKD

Alhamdulillah, all praise to Almighty Allah who made this possible for the editorial team to complete this publication. The Extended Abstracts of Final Year Projects from UiTM Terengganu Electrical Engineering Diploma students have been published since 2018 and e-ISSN was obtained from Perpustakaan Negara Malaysia in 2019. This year, 2021 witnesses the upgrade of this publication through collaboration with Jabatan Kejuruteraan Elektrik (JKE), Politeknik Sultan Mizan Zainal Abidin (PSMZA). We are very honored to work alongside JKE, PSMZA and we hope that this collaboration can be continued in the future. I would also like to thank and extend my gratitude to the management for approving this project and to all editorial team, as well as the contributing authors for this issue. Hopefully, this publication could benefit all the readers.

FOREWORD BY MR. SAIFUL AZIZI ABDULLAH
KJ JKE PSMZA

Alhamdulillah, all praises to Allah, for the successful publication of the Extended Abstracts of Final Year Projects in collaboration with UiTM Terengganu Electrical Engineering and the Department of Electrical Engineering (JKE), Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu has finally been realised. I congratulate UiTM Terengganu and the JKE PSMZA editorial team, as well as all parties engaged in this publication. The final projects created by electrical engineering diploma students are featured in this publication which will hopefully serve as beneficial resource for all students, particularly those studying electrical engineering, while they work on their final project. Thank you.

Extended Abstracts of Final Year Projects

Volume 1

AUTOMATIC LED STREETLIGHT WITH DUAL SENSOR

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Abstract: The advancement of the streetlight technologies has been rapid throughout the years. Nowadays, the smart and automatic system has been a major player in streetlight replacing old and conventional methods. The main objective of this project to generate power from solar to power up the streetlight, to control the streetlight power on/off by using LDR and PIR sensor and to complete the automatic LED streetlight with microcontroller to control the whole system. The system will automatically be controlled by the programmable microcontroller, to produce an optimum output, efficient in usage and significant energy consumption.

Keywords: Streetlight, solar power, microcontroller, LDR sensor, PIR sensor.

INTRODUCTION

The street light is essential component in road safety elements. The long network of the street light required an efficient power supply system. The conventional method of supplying power to the street light from the distribution required a long network system [1]. When disturbance occurred in this complicated network will require the longer time consumption and will involve a number of personnel [2]. This paper proposed the improved solar panel as primary source for the street light. The conventional method of controlling the street light involved the use of man power to switch on and switch off the street light [3]. The disadvantages was these personnel have multiple tasks that caused the negligence of to power up the street light [4]. The use of the presence and light sensor will improve overcome the problem. To maintain the whole system of the street light it required a high cost and involved a lot of man power [5]. The works of maintenances including bulb inspection, wiring inspection and physically pole inspection [6]. This project proposes the overall involving automatic system to control the road lamp. Objectives of this paper are to generate power from solar panels to power up the LED streetlight, to layout the road lamp using motion and light sensor to detect presence and light and to design an automatic system of road lamp using microcontroller. Street light is the important element in the road safety system. The purposes of the street light are to give a guidance to the road users. By this guidance, it will prevent the major accident from occurred [7]. The conventional of the street light system is using power from the distribution and its maintained manually by the power personnel. The maintenance`s cost is relatively high and, in some cases, due to lack of personnel the maintenance has to reschedule [8]. The study of the streetlight technologies has been performed rapidly through out he years. The replacement of the power source of street light to the more advanced system has been proposed. The recommendation of using renewable energy as a power source also has been suggested [4]. However, the were lacked of study on controlling the street light power system especially with advanced microcontroller. This project proposed the solar power as a primary source with the microcontroller to control the streetlight power system. The system is equipped with solar panel to harvest the radiation from the sun as the prime source. This energy then will restore in the lead acid battery for all time usage purposes. Then the voltage from the battery will regulate to a proper value power up the controller and finally to control on and off of the street light. From the block diagram (Figure 1: System Block Diagram) two types of sensors will be installed to control the darkness and the motion. The system will be automated turn on and turn off the LEDs based from the input of the sensors.

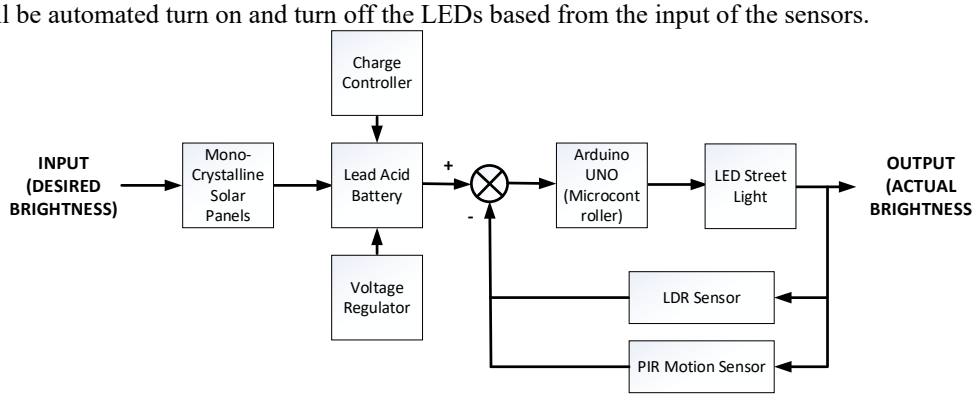

Figure 1: Block Diagram

Looking at the result, the street light was on when the surrounding was dark. All the LEDs will be on when the human presence is detected by the sensors. On the other hand, if the surrounding is bright the LEDs will be off.

METHODOLOGY

The system begins with initial condition all LEDs are off state. Then LDR sensor will be turn on, if the sensor detects a darkness 1 LED will on, or else all LED still in off state refer figure 2. PIR sensor will detect motion if there are, all LEDs will on, if not LED will be off.

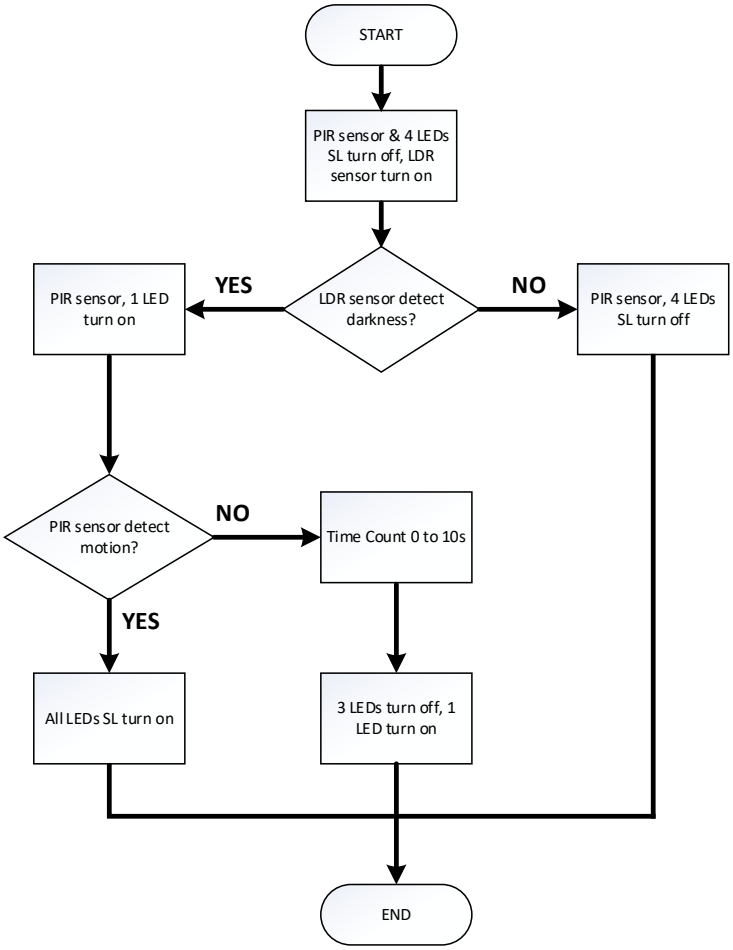

Figure 2: Flowchart of the System

RESULT AND DICUSSION

From the result, Table 1, shows that the sensors were successfully detected the inputs, and gave the required output.

Table 1: Results from the LDR and PIR Sensors

Light Intensity	**Movement**	**Output**
High	No movement	LED OFF (All LED OFF)
Low	No movement	LED ON (1 LED ON only)
Low	Has movement	LED ON (4 LED ON)

CONCLUSION

From the results, the project managed to produce electricity from the solar panels, and be able to control the on/off of the streetlight using LDR and PIR sensor. The sensors and solar PV were controlled by the microcontroller to make the system autonomous. The sensors working properly, it controlled the intensity of the streetlight, to give highly efficient and significant system. The system could be extended to the longer streetlight network however comprehensive design for the solar PV panels and the number of sensors will have to take into consideration.

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AUTOMATIC WINDOWS USING ARDUINO MICROCONTROLLER

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Abstract: Human beings need plenty of fresh, clean and comfortable air as well as a lot of sunlight to thrive. These two things are essential to our life. Window is the important part for a building that capable being open and close to admit light and air to come in and allow people to see out. However, it was difficult to control manually the open and close window if people were not around in the building especially student who were staying at student's residential college. This could lead to the problem of water leakage during the heavy rain and probably bugs got into the room at night. Therefore, the Automatic Window using Arduino Microcontroller is introduced for the student's residential college UiTM Cawangan Terengganu Kampus Dungun. The main objective of this project is to control the open and close window during the rainy day and day/night. This project conducted using rain sensor to detect the rainfall and using light sensors (LDR) to evaluate the outdoor environment for functioning automatically open and close the windows. The simulation result was conducted using Protues Software. The hardware result shows that when the rain sensor and LDR was detected (presence of rainwater and daylight), then the LCD and servo motor turned ON to close the window and vice versa. The contribution of this project could avoid the problem of water leakage and damage of student's personal things during heavy rain. It projects also could help student to get the good, clean and fresh air and natural light through the automatic window.

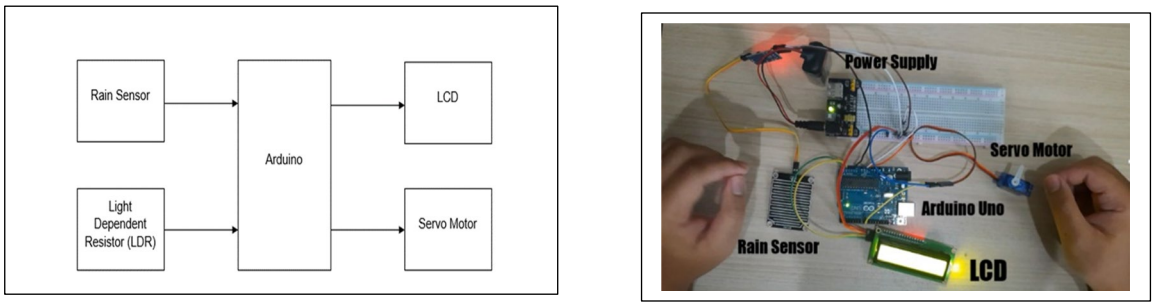
Keywords: Arduino, Microcontroller, LDR, rain sensor

INTRODUCTION

Nowadays, many things have been using automated system because the daily repetitive tasks such as open and close the window during the heavy rain and day/night will give less of a burden and makes your life simpler and easier. People do not have to worry about the simple things in daily life such as closing the window when it rains, or the night comes. The main purpose of our project is to control the windows at the student's residential college. The movement of the windows was using rain sensors and light sensors (LDR) to evaluate the outdoor environment for the function of automatically open or close the windows. For this project, we provided an affordable control system which was small and compacted for most of the rooms. Our scope of project is for the student's residential collage use only because there are many complaints from the students who were staying in the hostel that had the experience of damaged personal belongings during heavy rain and some scary bugs got inside the room. Besides, our project would be a good product to implement at other place such as office, home, and apartment. The reason we focused on student category as our target because we knew the student daily life were too busy and compact with their classes, assignments, and some of they did the part time job. So, with this project it would avoid them from worried and rushed to go back to their hostel to close the windows when it rains or night. As a result, our project was successful to prototype the automatic window using Arduino microcontroller. It would save people energy to open and to close the windows especially in Malaysia where weather conditions might change quickly and suddenly most of the time. Besides, this Automatic window using Arduino microcontroller was one of the best additions to the home smart system, as it was a relatively simple technology to adopt in people's daily life.

METHODOLOGY

This project is consisting of two parts hardware, and software. Hardware refers to the development of the device itself including the circuit constructing and soldering process. As for the software, it is focused on the program development. Specifically, during the simulation and compilation using Proteus Software and Arduino IDE [1-2].



(a) **(b)**

Figure 1. (a) Block diagram of project, (b) Circuit diagram on Bread Board

RESULT AND DICUSSION

This Automatic Windows consists of rain sensor, LDR, Arduino uno, servo motor and LCD. The result of the project is shown in Table 1.

Table 1. The result of project

Condition	Rain Sensor	LDR
ON	The rain sensor detected the presence of water then send the signal to Arduino Uno microcontroller. Then the LCD and servo motor received the signal. LCD displayed "It Is Raining" and the servo motor turned from 90° to 0°.	The LDR did not detect the presence of light then send the signal to Arduino. Then the LCD and servo motor received the signal. LCD displayed the "Be Careful While Driving" and the servo motor turned from 90° to 0°.
OFF	The rain sensor did not detect the presence of water then send the signal to Arduino Uno microcontroller. Then the LCD and servo motor received the signal. LCD displayed "Automatic Windows" and the servo motor turned from 0° to 90°.	The LDR detected the presence of light then send the signal to Arduino. Then the LCD and servo motor received the signal. LCD displayed the "Automatic Window" and the servo motor turned from 0° to 90°.

CONCLUSIONS

As conclusion, this system is designed to develop a system that can help students to control the windows at university when they are far enough from their collage. This feature can make UiTM student easier in their daily life as we know they are too busy and compact with their class, assignment, and some of they do the part time job.

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AUTOMATIC WATERING SYSTEM USING ARDUINO AND SOLAR POWER

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Abstract: The plantations require an irrigation system. The traditional method of watering plantations is typically inefficient, resulting in water waste. Overwatering the soil also promotes disease through the formation of fungus as a result of overwatering the soil. This project is proposed to address this issue. This project makes use of a soil sensor to detect the amount of water in the soil. The Arduino Uno controller reads the sensor value and controls the operation of the water pump. As a power source, this project also uses a solar panel and a 12 V battery. The system aims to assist and provide an automatic watering system that eases the burden on watering the plants. This system is also expected to help control water waste and produce healthier plantations.

Keywords: irrigation, Arduino Uno, Solar panel

INTRODUCTION

Plantations need a water supply to grow. According to [1], 80% to 90% of the plantation weight belong to the amount of water contains in the plantation. Water is crucial for plants because the water is used to send the required nutrient to the plants. But with the traditional process of watering the plant is time-consuming and can lead to overwatered and underwatered the plantation [1]. The recommended time to water the plantation is in the morning and the evening [2]. There are few basic ways to the watering system such as manually (hand watering) using hoses, sprinklers or nozzles, or automatically drip and sprinklers that have a clock-timer setup [3]. In addition, more advanced innovations that utilize the Internet of Things are also being practiced (IoT)[4]. The irrigation system is controlled by this automated control, which runs on electricity. Electricity and money can be saved by utilizing a solar system or photovoltaic system (PV). Furthermore, more time may be saved by employing solar-powered automated watering. Furthermore, the created automatic system employs automated drip irrigation and uses the correct amount of water necessary based on soil moisture, resulting in a system that wastes the least amount of water.

The developed system will be applied to the flower farm for the stingless beekeeping activity. Due to no power supply point on the flower farm, this system applied solar panels as the power source. This is also due to the abundance of solar energy received by the Terengganu state where it can be utilized effectively [5].

This project aimed to develop a watering system that harvests the sun power using a solar panel. The watering system pump is controlled by an Arduino Uno microcontroller. A soil sensor also is used to determine the level of water in the soil so that the plant can be watered only when needed. This system can eliminate the time taken by the farmer to water the plants and also able to avoid the plants from being overwatering and underwatering conditions.

METHODOLOGY

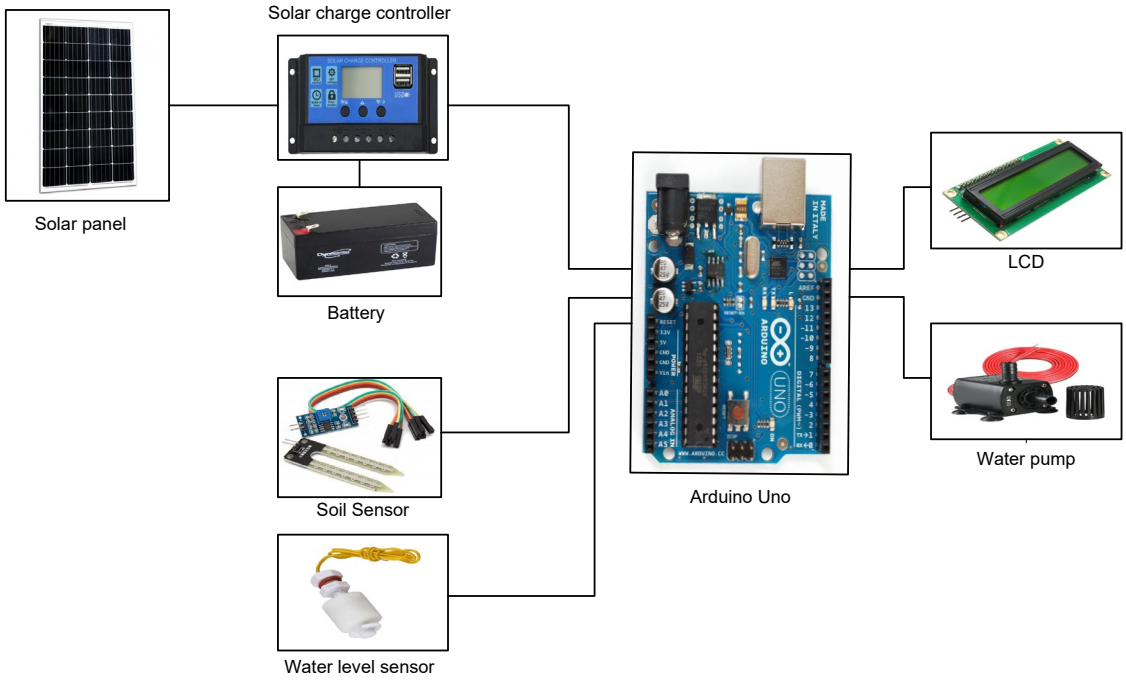

Figure 1. System block diagram

Figure 1 shows the system block diagram. The water irrigation system uses solar panels as the main power supply. The solar panel also is used to charge the battery using the solar panel controller. The battery is used to power up the water pump and the Arduino microcontroller. This system has two inputs which are a soil sensor and a water level sensor. The soil sensor measures the amount of water in the soil and a tank sensor (water sensor) measured the water tank level. When the soil sensor detects the soil is DRY, water pump starts to turn ON and irrigates the soil. If the water level in the tank is LOW, Arduino Uno automatically stops the water irrigation system using the water pump. When the water sensor measures the water level HIGH, the water irrigation system operates as programmed.

RESULT AND DICUSSION

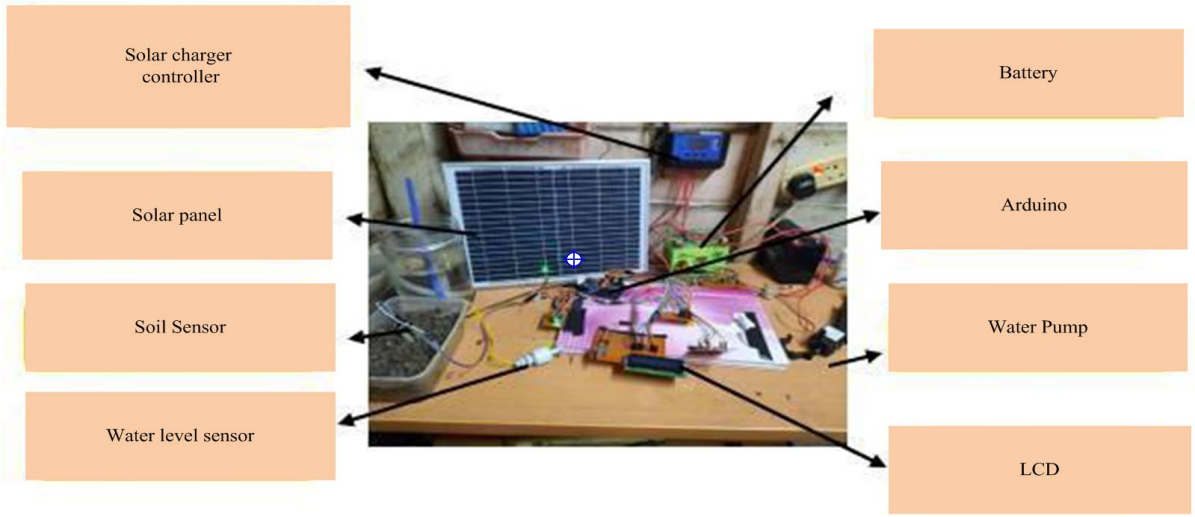

Figure 2. The project prototypes

The prototype of the project is shown in Figure 2 and the water pump operation is shown Table 1. The water pump only operates when the soil sensor detects the soil is 'DRY' and the amount of water level in the tank is 'HIGH'.

Table 1. Water pump operation

Soil Sensor		Water Level Sensor		Water pump
DRY	HUMID	HIGH	LOW	
DRY	-	-	LOW	STOP
-	HUMID	HIGH	-	STOP
DRY	-	HIGH	-	ON

CONCLUSIONS

With the proposed watering system, the amount of water in the soil can be controlled. When the soil contains enough water, the Arduino Uno microcontroller will turn OFF the water pump thus saving the amount of water used for watering the plant. This automatic watering system development is also able to reduce the amount of work required on watering the plants. Not only that with the usage of the solar panel is able to provide free energy to power up the watering system. Moreover, the project still can be developed on a larger scale by considering water pumps that have a higher capacity [2].

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DEVELOPMENT OF ARDUINO BASED WASTE SCALING MACHINE.

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Abstract: Each year, this country's waste production increases. Without a planned and orderly approach to garbage disposal, pollution will emerge, resulting in a disease that is harmful to humans. Recycled, reused, and reduced is the tagline for 3R programmes, a trash management initiative aimed at improving the environment. Typically, businesses that manage 3R waste provide a token to the consumer for each item supplied. Aluminium, paper, and plastic are all 3R materials with different token values per kilogramme. The manual approach being used currently requires the weighing of products and the calculation of the token value using a calculator. This system is inefficient and wastes time. This article describes enhancements to the existing 3R waste management system, in which the item is weighed and the machine automatically calculates and displays the token value for each predefined item. This project weighs the goods using a load cell, and the HX711 module amplifies the signal before it is transferred to the Arduino UNO. The LCD will indicate the item's weight and the value of the token the user will receive.

Keywords: *Scaling Machine, Load Cell, HX711, Ardunio UNO and 3R*

INTRODUCTION

Recycling is the process of reusing waste materials and objects. It is a viable alternative to "traditional" waste disposal that preserves resources and contributes to the reduction of greenhouse gas emissions. Composting or reusing biodegradable waste such as food or garden waste is also included in the definition of recycling. Recycling materials are either taken to a collection center or gathered curbside, where they are sorted, cleaned, and reprocessed into new materials for production. A few researchers has conduct a research about recycling material device and come out with viable solution for implementing it to the community. [1-3]. Generally, manual weight scale measuring is inconvenient because it is time consuming and requires correct readings. With this project, weight scale measurement and calculation become more convenient and time-efficient. The effect of this project will be to simplify the process of weight scaling from weight to cash, particularly on campus.

METHODOLOGY

Figure 1 depicts the system's block diagram; the three buttons indicate the various materials used in the system, including plastic, aluminum, and paper. The load cell is utilized to determine the weight of the item, and the signal is amplified by the HX711 module. The system is controlled by an Arduino UNO (ATMEGA 328) microprocessor, and the token value and item weight are shown via an LCD (16 x 2 pins I2C).

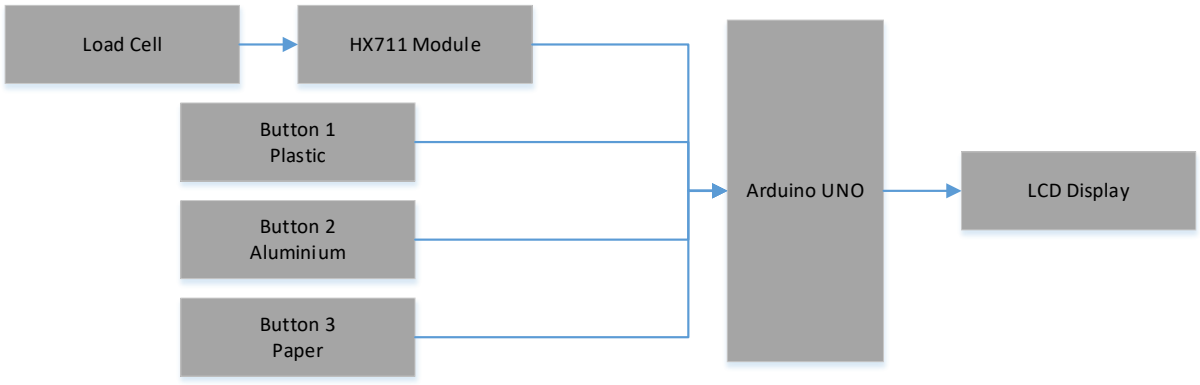
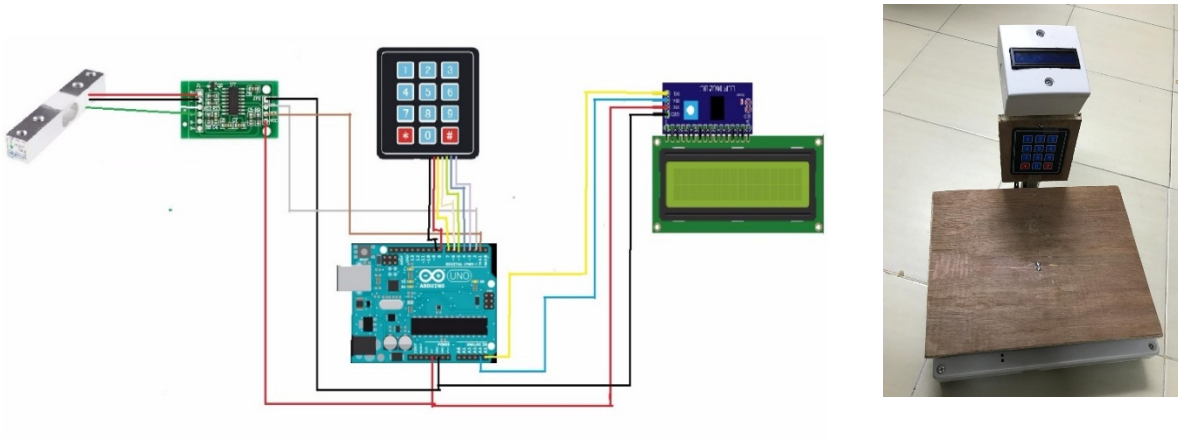


Figure 1. Project block diagram

RESULT AND DICUSSION



1.

(a) (b)

Figure 2. (a) Circuit simulation diagram. (b) Prototype of waste scaling machine

Figure 2 (a) depicts the project's circuitry, with the keypad working as a button for a recycling item. Figure 2 (b) shows the project prototype. The load cell is placed under the wooden plate. A maximum of 10 kg can be weighed using the load cell. By substituting a suitable load cell, this prototype can be improved to weigh items weight more than 10kg. On the other hand, because the system uses three buttons for plastic, aluminum, and paper, the selection of the pushbutton keypad should be emphasized. If the developer wants to include more trash types such as metal, bottles, and other items, the keypad must have more than three buttons. It utilized a 3x4 keypad for this project because we needed to provide a price conversion system. The operator can adjust the price as the price of each type of material or waste changes over the year or month.

CONCLUSIONS

This project's innovation will transform the existing manual system into a more efficient and user-friendly one. Additionally, it can be used to motivate and attract people to engage in waste disposal activities. Recycling initiatives will be fully executed with a better coordinated approach. In the future, it is intended that this machine would be installed in all government and school facilities to ensure thorough trash recycling and to make the workplace and classroom a more comfortable and clean environment. Indirectly, it can educate individuals about the importance of waste disposal.

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DEVELOPMENT OF A PORTABLE HYDRO GENERATOR

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Abstract: This paper described the development of portable hydro generator that produced electricity applied in waterfall or small river located in any outdoor environment. The concept of proposed project is to convert kinetic energy to electrical energy depending on reliable natural resources. The generated electrical energy can be used to supply a certain amount of electrical energy in rural areas. The proposed design of hydro generator is a low-cost production, and for addition, the hydro generator also must be as compact as possible and convenient during any outdoor activities.

Keywords: Portable hydro generator, kinetic energy, electrical energy, turbine.

INTRODUCTION

Power saving have become necessary in our daily basis life. This paper proposed a development of a small-scale hydro generator design that can be used during outdoor activities that can supply a certain amount of electricity. This generator operates in waterfall or small river that can be founded in the nature environment. The main objectives are to create a hydro generator that can be easily used at low-cost budget and able to supply electricity for low voltage appliances such as lamp and phone charging devices. The proposed design is based on hydropower energy since it is one of the most suitable and efficient source for renewable energy [1-2]. The proposed design is based on several studies about waterpower engineering which primarily deals with energy in the form of water flowing or falling. However, due to friction in bringing the water to and from the wheel, much of the energy available from the potential source will be lost [3]. Other studies also described that the lost in the wheel's hydraulic and mechanical friction, extra losses are sustained in every conversion, and if electrical and other transmission forms are used or auxiliary power is required to maintain continuous operation [4]. Energy is nature's active principle where energy can't be created or destroyed in nature, but its form can change from one to another. This is the main motivation that driven the development of the proposed design. However, the water must be in motion to generate electricity. This is energy which is kinetic (moving). The form is changed to mechanical (machine) energy when flowing water turns blades in a turbine. The turbine converts the rotor of the generator, which then transforms this mechanical energy into another form of energy, electricity. We call this hydroelectric power, or hydropower for short, because water is the initial source of electricity [5].

METHODOLOGY

1. In this paper, the proposed design requires a voltage reader that will as a voltmeter to display the voltage generated by the hydrogenator. The development of the voltage reader consists of Arduino Uno board, 16x2“ Liquid Crystal Display (LCD) and a few resistors. Based on Arduino IDE software, the Voltage Divider Rule (VDR) formula is calculated to measure the voltage. The most important condition for the proposed project, the design of the turbine that should be reliable with the water source. During initial phase, water pipe source was used to test the prototype turbine design and to test the rotation of the motor. The motor generator is a 12-volt DC motor. Then, the voltage reader will be connected to the DC motor to measure the voltage. For addition, a voltage regulator was applied to maintain or reduce the voltage that that has been generated by the DC motor. Furthermore, a voltage divider has been placed in the electrical circuit to adjust the voltage. This component is important to avoid harm to the electrical circuit caused by unstable volume of generated electrical energy. The water source will rotate the turbine that is connected to the DC motor and it will generate the electricity. The electricity will flow to the voltage reader trough the resistors and it will measure the value of the voltage by using the VDR rules. Then, the voltage reader will send the measured value to the LCD and it will show the value of voltage. The battery will be used to turn on the voltage reader and LCD. For the output of our DC motor, the voltage regulator is used to maintain the value of the voltage. **Figure 1** displays the block diagram of the system of proposed design. While **Figure 2** displays the connection of the components in the electrical circuits.

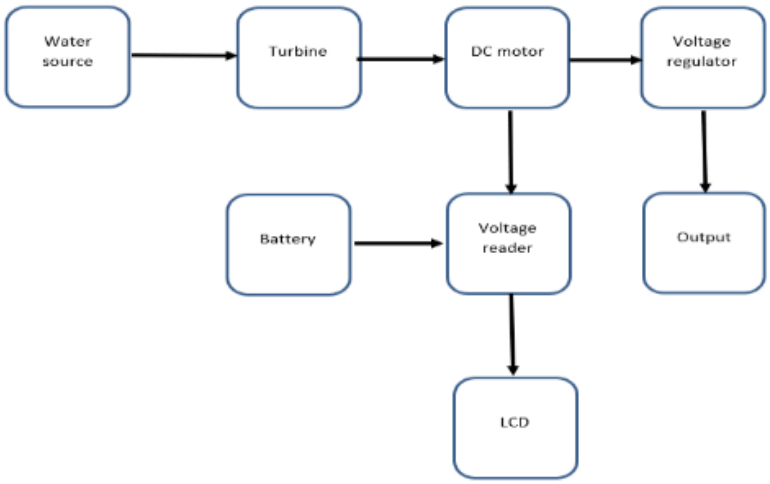

Figure 1: Hydropower System Design

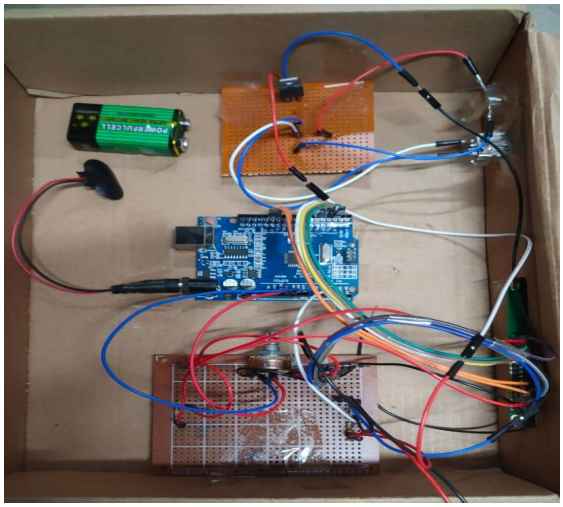

Figure 2: Electronics component

RESULT AND DICUSSION

For the result, **Table 1** displays the simulation results for the minimum voltage that are needed to turn on the LED light using Proteus software. A DC fan component was applied to measure the maximum speed of the fan according to the voltage that are provided from the DC supply. For the result in **Table 2**, displays the actual voltage generated by the designed hydro generator. The value of the voltage generated is based on the speed of the water from the water pipe.

Table 1: Result based on simulation in Proteus

Voltage Value (V)	Condition of LED	Condition of the appliances (Dc fan)
3.0	The LED light did not turn on.	The DC fan rotate very slow and its speed is 580 RPM
4.0	The LED light turn on, but the light come from the LED is not very bright.	The DC fan rotate faster than before, and the speed is 910 RPM
5.0	The LED light turn on and the light come from LED is brighter.	The DC fan rotate really fast and the speed is 1.23 kRPM

Table 2: Result based on actual generated voltage

Water Speed	Voltage Value at Voltage Reader (V)	Voltage Value in Multimeter (V)	Condition of LED	Condition of the appliances (Powerbank)
Slow	2.94	3.01	The red LED did not turn on and not emit any light.	The powerbank did not charge.
Moderate	3.95	4.12	The red LED turn on and produce a bright light.	The powerbank still did not charge.
Fast	5.03	5.10	The red LED turn on and produce the same brightness.	The powerbank was able to be charge.

CONCLUSIONS

From the results, the proposed hydro power design is successful to generate electricity from water source using the portable hydro generator. The generated electric power can be used to supply voltage for low voltage electrical appliances such as bulb and power bank. The Arduino is used to show the amount of voltage produced by using voltage divider rule. However, for future projects, the characteristics of the water source should be determined and investigated including the water flow speed and conditions, so that a reliable data can be used to design the hydropower system efficiently.

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