

Development of RE Portable Power Outlet via IOT

Muhammad Zulfadli Ahmad Zahid¹, Izanoordina Ahmad¹, Siti Marwangi Maharum¹
Zuhanis Mansor²

¹Electronics Technology Section

²Communication Technology Section

Universiti Kuala Lumpur British Malaysian Institute

Corresponding email: mzulfadli.zahid@s.unikl.edu.my

Abstract: The project utilises acid lead batteries as main power and collects power from solar panels as renewable energy by taking advantage of temperature in Malaysia. This project will automatically divide power to other component functionality and could be monitored via IOT system to ensure the relevant information where the box is installed. However, to complete the project, obtaining a stable power source from sunny to rainy days and long-lasting for power electrical appliances is challenging. The project needs solar panel as a main electrical charging device to support battery power. This project's sensor accurately measures the power level through IOT. The casing is made to resist any water damage to the battery during unpredictable weather. Developing a portable Power Outlet (IOT) with solar system will support the battery lifetime power that suits this form of portable outlet in the middle of usage. The additional function of the project is to build a framework that can provide the user with the perfect details, so they can take action and set up the next steps. Developing portable Power Outlet (IOT) with solar system was a successful concept proof. The system is cost-effective and provides very stable autonomous temperature-resistant behaviour. However, there's room for improvement. We could add new renewable energy such as hydro power to help solar panel feature to charge the battery and reliable sensor according to user needs.

Keywords: Renewable energy, Internet of Things, Portable Power Outlet, Solar system, Energy level

1.0 INTRODUCTION

The Portable Power Outlet Via IOT is different from other power outlet or UPS device due to its features. Basically, the normal power outlet cant conduct on a long-term basis, and the user must remain manually monitoring the power usage. This project integrates electrical and electronics with renewable energy and internet technology.

The project consists of acid lead battery, solar panel, IOT system and digital battery status information display. Power protection will be added to avoid over loaded power that will damage another project intended to supply. Once the other devices connects to power, the light indicator will pop up to indicate the readiness.

The main objective of this project is to develop a Portable Power Outlet via IOT within required range and specific objectives of this project are listed as followed:

- It will automatically divide the power equally to other project function. This project is done by developing the circuit of IOT (internet of things) which could connect to the Wi-Fi and transmit the information performance level to the user. Other than that, it could be used to maximise the capability compare to the traditional way to monitor source of power.

- The power will be divided to each socket with the amount voltage that needed and the light from the socket will pop up automatically.

- This project will be displaying the level energy consumption condition. Also, it could show informative indications through the Blynk application on the phone.

2.0 LITERATURE REVIEW

2.1 The advanced technology behind the portable power outlet

Many devices were supplied with lead acid batteries and have significant market share, which is rechargeable batteries in terms of sale and production. Lead-acid cells are made from lead alloy grids that mechanically support active materials and serve as current collectors [1]. For instance, the portable outlet with greater battery capacity compared to the other option of using the same concept. To make it reliable for such outdoor operation, it must be compatible with the renewable energy system that also contributes to battery life. However, electricity from renewable energy sources is plagued by fluctuations resulting in lack of stability if the energy supplied from such sources is used in 'real time' [2].

2.2 The technology behind the portable power outlet

Other projects have similar roles to our project. Over the past two decades, the rechargeable battery's operating efficiency and lifetime have improved dramatically due to increasing developments in battery materials and technologies[3]. For example, prototype; portable AC outlet Power bank. It's a project that uses 5Pcs Geekreit Mini DC-DC Converter Adjustable Power Supply to step down the module. Project prototype has 3S 12V 10A 18650 Battery Charger Safety Board Module 11.1V 12.6V with Over-Charge Circuit Protection Feature. If overload occurs, it will trigger during automatic mode and cut off the supply. Some UPS can link to a source of alternating current (AC) and solar power[4].



Figure 2.1 Existing portable power outlet in the market

Analogue switches will trigger signals to activate AC power to the output. The output will detect input that attach into the socket and that will give signal to the 150W DC-AC Inverter to channel the electrical supply as the input connected while the light indicator pop out will also give the signal to the user that the equipment attach are already running in use. The output comprises with a low power-high determine to AC equipment usage. In the related-art DC power supply apparatus connected to the AC power supply for improving the power factor of the power supply and suppressing the harmonic current of the power supply, the switching is performed by the switching frequency [5].

2.3 The Internet of Things (IOT)

The Internet of Things (IoT) plays a vital role in exchanging data between sensors and electrical power. The proposed IoT model showed the sensor-to-control unit bidirectional contact and vice versa[6]. The basic function is still the same: the battery voltage will be the source power of electricity to supply the output. The difference between these two projects is upgraded function ability to meet the main project function objective.

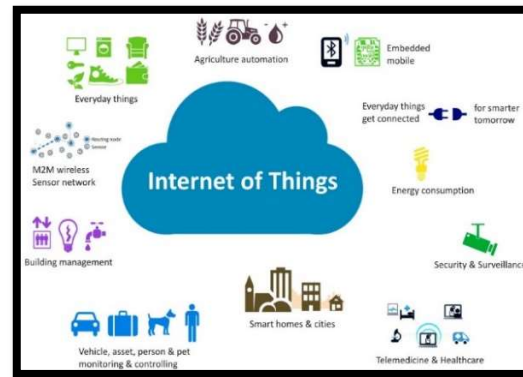


Figure 2.2 Application of internet of things (IOT)

Here the energy monitoring and control is not enough, power saving is very much important for future [7]. IOT can be accurate in commercial purposes for instance medical and healthcare use this term to track patient wellbeing, collect data and every other reason. This technology would create a digitised framework that can interact with any medical resources.[8]. Ultimately, the IOT was applied to transport system such as traffic control, parking system, toll collection system and many other applications.

3.0 METHODOLOGY

The project development progress is explained with the aid of circuit diagrams from designing to the final touch up. At the end of this chapter, we summaries the method and techniques used to complete this project.

3.1 Input

This project requires 12 volts DC 7ah supply for circuit service. Approximately half day voltage generation requires to generate sufficient power. This battery source is the main source for the other output. Other than that, the fuse (overload protection) is used to avoid manual charging to protect overload that can harm the battery internally and physically.

Moreover, as for the monitoring method, this project used DC 12 v battery meter voltage control gauge. This project used meter that will have a connection when the current and voltage flows on it.

3.2 Process

The solar charge controller is the input-output relation. The rechargeable device inlet is connected directly to the overcharge safety circuit, which may adjust the decision to cut the power to preserve the battery life between the battery and charging system. On the socket side, blue LED pop up shows input link is ready to use in great condition. If the battery voltage remains insufficient, the user will be notified via Wi-Fi link using the interface user app.

3.3 Output

A 12 V DC output will be connected to 2 socket and 1 USB hub inlets. The pop-up LED indicate running connection for the output and ready to use. The battery can circulate rechargeable solar panel energy to ensure long-lasting battery use for at least one day. The IOT system would indicate temperature, humidity and voltage feedback on the phone's Blynk system interface to indicate the user's operating system.

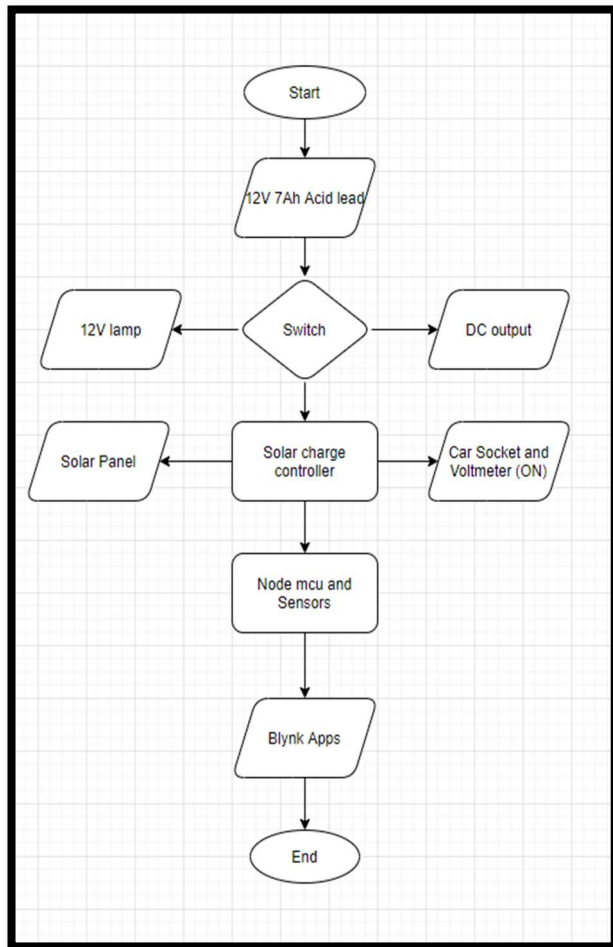


Figure 3.0 Flowchart of Development of RE Portable Power Outlet Via IoT.

4.0 RESULTS AND DISCUSSION

An essential capacity comprises each capacity proposed before with the connection of goal communicated into a few

portions which later appeared into one accumulation of effective model.

4.1 Results 1 Solar panel as second source of power

The primary source of the project is renewable energy. Thus, solar panel are added as a second source of supporting input. It is reliable renewable energy compared to other due to weather in Malaysia. The solar panel come with variant spec and regarding to the project, it is using model type SY-5M with maximum power current (Imp) 0.3A, maximum power voltage (Vmp) 16.8V.



Figure 4.1a Solar panel receiving voltage input

The output has tested several times and recorded the current that solar panel receive. The project has tested and recorded the output result in Gombak, Selangor which the surrounding temperature are at the most heat at average 35-38-degree Celsius. Therefore, this system is meant for outdoor location capture only for maximum appliances on the features.

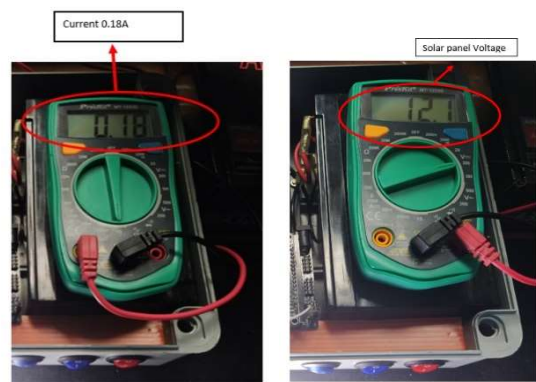


Figure 4.1b Solar panel voltage and current reading

4.2 Results 2 IOT system indication voltage sensor

The coding for the basic voltage module is embedded included in library NodeMcu esp 8266. There is only one voltage detection are specifically for solar panel output information.

Blynk interface voltage meter will react when the solar panel gets enough power voltage and inform the user about the current-voltage, which charges the main input acid lead battery.

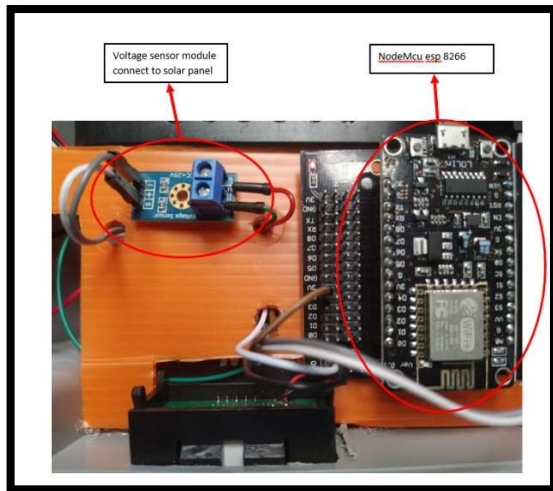


Figure 4.2a IOT system placement (voltage sensor)

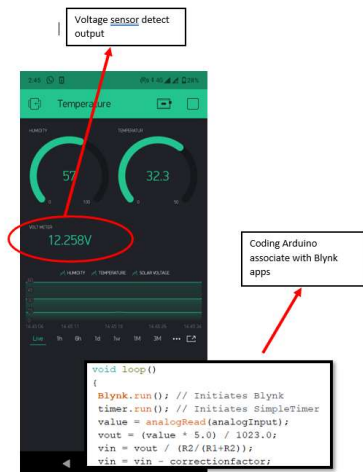


Figure 4.2b Solar panel voltage meter on Blynk apps and coding

In the At the beginning, several attempt of the value that represent resistor on voltage sensor are done to achieve the result. Voltage out receive input divide by 2 resistors will recognise and minus correction factor will indicate result as voltage in. The pin allocation for NodeMcu analog prevent the system clash with other function

4.2 Results 3 IOT system indication humidity and temperature sensor

The DHT11 is a commonly used temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also

factory calibrated and hence easy to interface with other microcontrollers.

The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%.

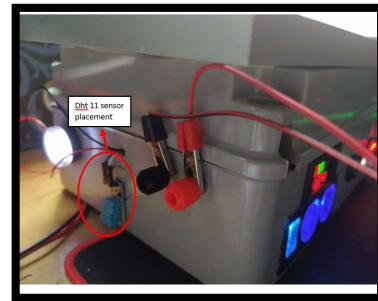


Figure 4.3a Humidity and temperature sensor placement

In figure 4.4a shown the placement of dht11 humidity and temperature sensor on side of the box. The sensor is place beside of the box because it can read more precise humidity and temperature condition.



Figure 4.3b: Humidity and temperature meter Blynk interface indication

This project its intentionally to modify features which is putting the humidity and temperature to indicate the surrounding condition of the project where its place. The aim of the project application is its can operate without need to monitor closely by the user and furthermore the project can run independently. It gives benefit to the breeders that for example want to run electric appliances form far and long run. In mean time, the user can get informative indication such humidity and temperature in actual time to allow user to take an action.

4.4 Results 4 Output project

There is three physical output going out according to 12v rocker switch attach. To finalise the hardware application, the component must arrange in place to make sure there is no component clashing with other circuit. Connection of the component wire is properly on its place to prevent short circuit happen thus it can blow up the component inside the box.

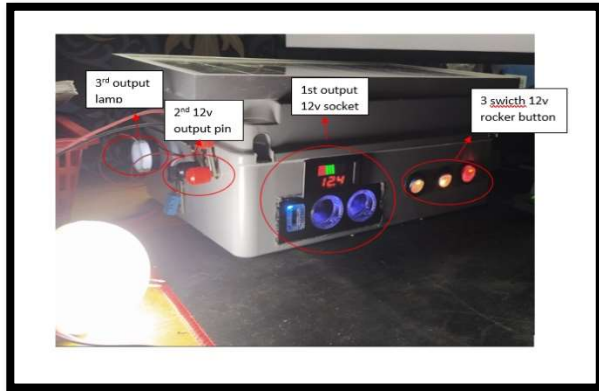


Figure 4.5 Output project

This project comprises three rocker buttons controlling three outputs as in Figure 4.5. The first output connected to two car sockets on the market compatible with portable AC inverter. When the light turns on, it indicates that the device is ready to be used and it will generate 12v on each socket hole. Furthermore, USB inlet for USB compatibility, mainly for phone charging. For second input, it's fitted with positive and negative pin with 12-volt power on the side of the box. Finally, third output its attached the flashlamp of 12 volts on the side of the box to allow the user perform any outdoor activity in the dark.

5.0 CONCLUSION

For the conclusion of this project, it has been successfully done as the objectives are achieved. Development of portable Power Outlet with (IOT) with solar system can survive the other combination project that attach to solar panel as second source of portable power outlet in the middle of the usage. The goal of the project is to create a system that can provide the perfect information using IOT technology to the user so

they can take an action.

As the goals are accomplished, this project was successfully completed. Development of portable Power Outlet (IOT) with solar system will support the other combination project connected to the solar panel as the second source of portable outlet. The project's aim is to build a framework that can provide the user with the perfect information using IOT technology to operate.

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