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IoT BASED HYBRID POWER GENERATION TREE

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ABSTARCT: *The rapid growth of technology and infrastructure has made our lives easier. In recent years we are facing the power cut problems due to increasing demand of electricity, due to the development of industrial automation that requires huge power. This project is used to generate the power by using different methods that can be stored in the battery. The battery is then discharged to power DC loads. In this project, we have focused on controlling of hybrid energy system using IOT. The microcontroller ensures the optimum utilization of resources and it also increases the efficiency of the combined system as compared to the individual mode of generation. It helps decreases in the dependence on one single source and makes the system more reliable. The hybrid system can be used for both industrial and domestic application.*

1. INTRODUCTION:

The main objective of this paper is to design and to implement the hybrid power generation. This hybrid generation will provide electrical energy in areas where electrical grid is not reached yet and hence can light up many homes with affordable price. The renewable energy source generates electrical energy efficiently without any impact on the environment. Energy can neither created nor be destroyed but it can be transformed from one another form. There are two types of energy sources available, which can be used to generate the electricity. They are renewable and non-renewable energy resources. Nonrenewable energy resources are coal, nuclear, oil, and natural gases which are limitedly available, and the renewable energy resources are sunlight, wind, rain, tidal, waves and geothermal heat and this sources are naturally replenished on human timescale. Multinational company (MNCs) is also need certain megawatt (MW) interruption free power supply. This means that we may experience power cut much more than 60% in the short future. To compensate this power demand, power production through hybrid energy harvesting from piezoelectric material, solar panel vertical axis wind turbine and water turbine methods are used. Energy is more due to the rapid increase in world population, technologies and other political and economic condition. Now a day's electrical energy is generated by the conventional energy resources like coal, diesel and nuclear etc. And this are depleting day by day. So there is an urgent need to switch on to non-conventional energy resources at this point IoT plays an important role in controlling system the data is transmitted from power generation module wirelessly trough website to ESP32 module which monitors the source of energy. The transmitted data is monitored remotely using IoT in android cellphone and the result can also be displayed on LCD using microcontroller. In this project where user can monitor the how much voltage produced by each method of power generation by using Wi-Fi module. Solar and wind are easily available in all condition can be good alternative sources with the rise in the demand of renewable energy resources the need of better utilization of this system as aroused. This intern as given rise to the hybrid energy system. Hybrid energy system is the combination of two or more energy system. Here, two sources are used solar and wind energy. In order to control the hybrid system IoT can be used. IoT (internet of things) is the inter-networking of physical device embedded with electronics, software, sensor, and network connectivity that enable object to collect and exchange the data. IoT is used to switch the power supply i.e., wind energy and solar energy of a house through secure website and the grid supply is off. A prototype is designed to control the switching between these two sources of energy. With the advancement in technology provide sensors, metering, transmission, distribution and flexibility to consumer of electricity, it can be possible to control the source of energy of a house by this prototype.

2. PROPOSED ALGORITHM:

The block diagram of the Proposed System is shown in Fig.2. The Proposed System overcomes all the drawbacks of the IoT based hybrid power generation tree.

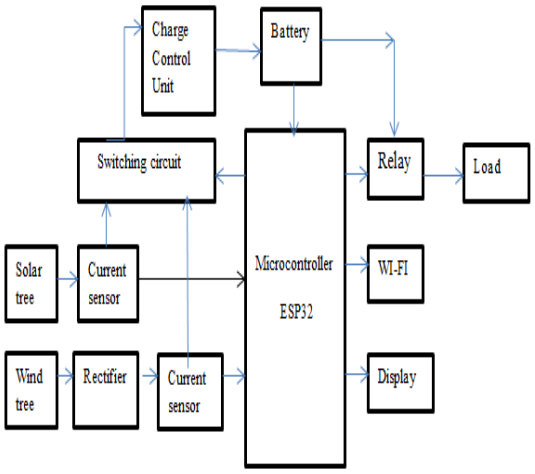

Fig2. Block diagram of IoT based hybrid power generation tree.

2.1. Microcontroller (ESP32):

Fig2.1. Microcontroller (ESP32).

The ESP32 are built in processor. However due to multitasking involved in updating the Wi-Fi stack most of the application use a separate micro-controller for data processing, interfacing sensors and digital input output. With the ESP32 you may not want to use an additional micro-controller. ESP32 has Xtensa Dual-core 32-bit LX6 microprocessor, which runs up to 600 DMIPS. The ESP32 will run on breakout boards and modules from 160MHz up to 240MHz. that is very good for anything that requires a microcontroller with connectivity options. The two cores are named protocol CPU (PRO_CPU) and application CPU (APP_CPU). That basically means the PRO_CPU processor handles the Wi-Fi Bluetooth and other internal peripherals like SPI, I2C, ADC etc. The APP_CPU is left out for the application code. This differentiation is done in the Espress if internal development framework (ESP-IDF).ESP-IDF is the official software development framework for the chip. Arduino and other implementations for the development will be based on ESP-IDF.

ESP32 has a lot more features and it is more difficult to include all the specification in this getting started with ESP32 guide so, I made a list of some of the important specifications for ESP32 are,

- Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240MHz.
- 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
- Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150.Mbps.
- Support for both Classic Bluetooth v4.2 and BLE specifications.
- 34 Programmable GPIOs.
- Up to 18 channels of 12-bit SAR ADC and 2 channels of 8-bit DAC.
- Serial Connectivity include 4 x SPI, 2 x I^2C, 2 x I^2S, 3 x UART.
- Ethernet MAC for physical LAN Communication (requires external PHY).
- 1 Host controller for SD/SDIO/MMC and 1 Slave controller for SDIO/SPI.
- Motor PWM and up to 16-channels of LED PWM.

2.2. Current Sensor (ACS712):

Fig.2.2. Current Sensor (ACS712)

The ACS712 is a fully integrated, Hall Effect based current sensor with 2.1KVRMS voltage isolation and integrated low resistance current conductor. The ACS712 provides economical and precise solution for ac and dc current sensing in industrial, commercial and communication system. The device consists of a precise, low-offset, linear all sensor circuit with a copper conduction path located near surface of the die. Applied current flowing through the copper conduction path generates a magnetic field which is sensed by the integrated HALL IC and converted in to proportional voltage is provided by the low-offset chopper stabilized

BICMOS HALL IC which is programed for accuracy after packing.

2.3. DC relay:

Fig2.3. DC Relay

Relay works on the principle of the electromagnetic induction. It is an electrically operated switch, when the electromagnetic is applied some current it induces a magnetic field around it. In the relay copper coil and iron core acts as electromagnet. When the coil is applied with the dc current it starts attracting the contact as shown this is called energized of relay. Relays are used to protect the electrical system and to minimize the damage to the equipment connected in the system due to over current/voltages.

2.4. LCD Display:

Fig2.4. LCD Display.

A liquid-crystal display (LCD) is a flat- panel display which uses liquid crystals in its primary from of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computers etc. LCD is a combination of two states of matter, solid and liquid. LCD uses a liquid crystal to produce a visible image. LCD displays are super-thin technology display screens. LCD's technologies allow displays to be much thinner when compared to a cathode ray tube (CRT) technology. Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal forms the colored image.

2.5. Solar Panel:

Fig2.5. 3Watts Solar Panel

Solar panel is use to convert solar radiation to the electrical energy. The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material. When the junction absorbs light, the energy of absorbed photon is transferred to the electron proton system of the material, creating charge carriers that are separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. Solar array or panel is a group of a several modules electrically connected in series parallel combination to generate the required current and voltage. Solar panels are the medium to convert solar power into the electrical power. There are three main ways to harness solar energy are, photovoltaic, solar heating & cooling and concentrating solar power. Photovoltaic generate electricity directly from sunlight via an electronic process and can be use to power such as calculators and solar street lights and large commercial businesses. Solar heating & cooling(SHC) and concentrating solar power(CSP) applications both use the heat generated by the sun to provide space or water heating.

2.6. Wind Turbine:

Fig2.6. Wind Turbine

Wind turbine is that system which extracts energy from wind by rotation of the blades of the wind turbine. Basically wind turbine has two types one is vertical and another is horizontal. As the wind speed increases power generation is also increases. The power generated from wind is not continuous its fluctuating. For obtain the non-fluctuating power we have to store in battery and then provide it to the load. The wind needs less cost for generation of electricity. The generation of electricity from wind is depend upon the speed of wind flowing. Anything that moves has kinetic energy, and scientists and engineers are using the wind's kinetic energy to generate electricity. Wind energy is created using a wind turbine, a device that channels the power of the wind too generate electricity. The wind blows the blades o the turbine, which are attached to a rotor. The rotor then pins a generator to create electricity. There are two type of wind turbine, horizontal-axis wind turbine and vertical-axis wind turbine. Small, individual wind turbines can produce 100kilowatts of power, enough to power a home. Small wind turbines are also used for places like water pumping stations. Large wind turbines sit on towers that are as tall as 80 meters and have rotor blade that extend approximately 40 meters long. These turbines can generate 1.8 megawatts of power.

2.7. WI-FI Controller:

Fig2.7. Wi-Fi controller.

Wi-Fi is a wireless networking technology that uses radio waves to provide wireless high-speed internet accesses. A common misconception is that the term Wi-Fi is short for "wireless fidelity", however the Wi-Fi is a trademarked phrase that refers to IEEE 802.11x standards. Wi-Fi networks have no physical wired connection between sender and receiver instead, they functions by using radio frequency(RF) technology a frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space.

2.8. Battery:

Fig2.8. Battery (12V-7AH).

A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in a battery involve the flow of electrons from one material to another, through an external circuit. Batteries are a collection of one or more cells whose chemical reactions create a flow of electrons in a circuit. All batteries are made up of three basic components are anode, cathode and electrolyte. The batteries that must throw away after use are known as primary batteries. Batteries can be recharged are called secondary batteries.

2.9. Rectifier:

Fig2.9. Rectifier

A rectifier is a device that converts an oscillating two-directional alternating current (AC) into a single-directional direct current (DC). This involves a device that only allows one-way flow of electric charges. The simplest kind of rectifier circuit is the half wave rectifier. It only allows one half of an AC waveform to pass through to the load. In large number of electronic circuits, we required DC voltage operations, hence it converts AC voltage into DC voltage b using a device called P-N junction diode. A P-N junction diode allows electric current in only forward bias condition and blocks the electric current in reverse bias condition. In simple conditions the diode allows electric current in one direction. The unique property o the diode allows it to acts like a rectifier.

3. CONCLUSION:

Developing Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilize where it generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for generation. It only need initial investment. It has also long life span. Overall it has good, reliable and affordable solution for electricity generation.

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