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IOT BASED HYBRID ENERGY SYSTEM USING NODEMCU MODULE

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Abstract— This Paper focused on controlling of hybrid energy system using IOT. There is various combination of energy and all of them are alternative to each other like solar energy, wind energy, bio fuel, fuel cell, etc. But the need of controlling of hybrid energy system arises when it is installed for domestic or commercial purpose. At this point IOT plays an important role in controlling system. The main criteria being switching between the two sources of energy i.e. solar and wind energy without any inconvenience through a website using NODEMCU Wi-Fi module. The data is transmitted wirelessly through website to NODEMCU module which controls the sources of energy. The transmitted data is controlled remotely using IOT. This enables user to have flexible control mechanism remotely through a securedinternet web connection. This system helps the user to control thesources of energy, manually and remotely using smart phone orpersonal computer. This system is very efficient, cheaper andflexible in operation.

Keywords— Hybrid energy, NODEMCU Wi-Fi,Internet Of Things.

I. INTRODUCTION

Energy is the basic need for development and the requirement of energy is more due to the rapid increase in world population, technology 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 these are depleting day by day. So, there is an urgent need to switch on to non-conventional energy resources. Solar and wind are easily available in all condition can be good alternative source. With the rise in the demand of renewable energy resources the need of better utilization of these systems has aroused [1]. This in turn has given rise to the hybrid energy system. Hybrid Energy System is the combination of the two or more energy systems. Here, two sources are used solar and wind energy [2]. In order to control the hybrid system IOT can be used. IOT (Internet of Things) is the inter-networking of physical devices embedded with electronics, software, sensors and network connectivity that enable objects to collect andexchange data [3]. IOT is used to switch the power supply i.e., wind energy and solar energy of a house through secure website when the grid supply is off. A prototype is designed to control the switching between these twosources of energy.

II. SYSTEM DESCRIPTION

The proposed system has two main parts hardware and software. The hardware part consists of four main hardware components Solar Panel, Wind Mill, Switching element,NODEMCU Wi-Fi module. Software part consists of Arduino integrated development environment (IDE).NODEMCU module is used to transmit and receive the electrical data wirelessly, which is collected from internet through designed website and the control system. The NODEMCU transmitter is interfaced with various sensing devices and reliable data reception at a receiver side of NODEMCU module. The controlling operation is performed in two ways. Those are manual controlling and remote controlling.

III. HARDWARE ARCHITECTURE

The project is built on NodeMCu and has LCD module for the user interface, A NodeMCu user input and a relay circuit to control the Energy sources Wind or Solar, interfaced to it. A NodeMCu wifi module used to switch the enegy souces wirelessly using IOT with the Arduino is utilized in the project. The Arduino code is written on the Arduino IDE. The relay circuit controlling the Hybrid Energy Sources with the NODEMCU Wi-Fi Module. In this research work NodeMCu wifi module and voltage regulator are used for hardware implementation.

3.1. NodeMcu Wi-Fi Module

Nodemcu is an open source IoT platform. It includes firmware which runs on the **ESP8266** Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "*NodeMCU*" by default refers to the firmware rather than the development kits.

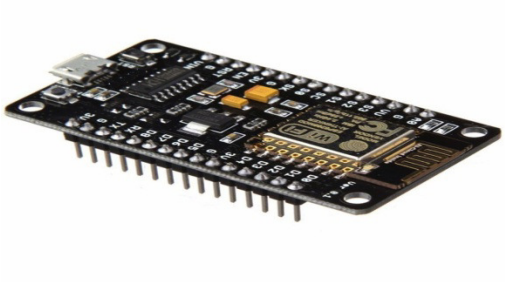

Fig 1. NodeMcU

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors. They did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 WiFi SoC, popularly called the "ESP8266 Core for the Arduino IDE".[16] This has become a leading software development platform for the various ESP8266-based modules and development boards, including NodeMCUs

Features

- 32-bit RISC CPU: Tensilica Xtensa L106 running at 80 MHz*
- 64 KiB of instruction RAM, 96 KiB of data RAM
- External QSPI flash: 512 KiB to 4 MiB* (up to 16 MiB is supported)

- IEEE 802.11 b/g/n Wi-Fi
  - Integrated TR switch, balun, LNA, power amplifier and matching network
  - WEP or WPA/WPA2 authentication, or open networks
- 16 GPIO pins
- SPI
- I²C
- I²S interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
- 10-bit ADC

3.2. Router

A router is networking gadget designed to receive, analyze and transfer incoming packets to another network. It is a networking device which forwards the data packets and performs the "traffic directing" functions on the Internet. A data packet is usually forwarded from one router to another over the networks that establish the inter-networking until it enters its destination node [8].

3.3. OP-AMP [AP 358]

It consists of two independent, high gains; internally frequency compensated operational amplifiers that are designed specifically to work from a single power supply over a wide range of voltages. The rating is ±15V power supply with 1 A current. The output voltage is +5V.

3.4.Voltage Regulator [AMS 1117-3.3]

This is a flexible and immovable voltage regulators are designed to provide up to 1A output current and is operated on 5V input. The dropout voltage of the device is guaranteed maximum 1.3V, decreasing at lower load currents. Power source circuitry and regulator in both to lessen the stress under overload situation to limit current. Low current drop. It converts 5V, 0.7A into 3.3 V for ESP8266 module. There are three pins,

• Ground
• Output (3.3 V)
• Input (5 V)

IV. SOFTWARE ARCHITECTURE

In this research work two software Arduino Integrated Development Environment (IDE) and NodeMcU Wi-Fi Module application are used.

4.1. Arduino IDE

The program code written in Arduino IDE is known as a sketch. The Arduino IDE software used for developing sketches for NodeMcU. This IDE contains the following parts in it [9]:

• Text editor: This is where the interpreted code can be written using a simplified version of C++ programming language.

• Message section: It shows error and also gives a feedback on saving and exporting the code.
• Text: The soothe displays text output by the Arduino environment along with complete error messages and other information
• Console Toolbar: This toolbar encompass various buttons like Verify, Upload, New, Open, Save and Serial Monitor. On the bottom right hand corner of the window there displays the Development Board and the Serial Port in use.

V. CONCLUSION

In this paper we have introduced design and implementation of a flexible and wireless solution to the Controlling of Hybrid Energy. The system is secured for access from any user or intruder. The users are expected to acquire pairing IP Address for the Arduino IDE and the cell phone to access the Hybrid Energy system. This adds a protection from unauthorized users.

VI. REFERENCE

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