Smart control of electrical appliances through IOT using renewable energy source

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ABSTRACT

This work deals with control of parameters using internet of things (IoT). This gives inhabitant accesses to control some parameters remotely.

The power supply given to the parameters is produced by using one of the most available renewable energy sources i.e., wind energy . This work extensively helps in energy conservation .

The smart control of parameters can be done by sensing and controlling of different parameters in home is done using " NODE MCU Micro controller board " which allows real time data sensing, processing and controlling. This work is independent of commercial power supply.

1. INTRODUCTION

This work deals with control of parameters using internet of things (IoT). This gives inhabitant accesses to control some parameters remotely. The power supply given to the parameters is produced by using one of the most available renewable energy sources i.e., wind energy . This work extensively helps in energy conservation .The smart control of parameters can be done by sensing and controlling of different parameters in home is done using " NODE MCU Micro controller board " which allows real time data sensing, processing and controlling. This work is independent of commercial power supply.

Theoretically, the power output by a wind turbine is proportional to cube of the wind speed. It implies that any method, which can increase the wind speed around the turbine even by small factor, can largely improve its power output. It has been recently found that a duct in the form of a diffuser around the wind turbine can augment the wind speed near the turbine blades. The diffuser essentially allows turbine's exhaust flow to expand and thus produces sub-atmospheric pressure in the region near to turbine exit. The low pressure region draws more wind and causes it to accelerate. This is the reason why a ducted wind turbine with a diffuser exhibits higher power output than a wind turbine without diffuser.

Horizontal axis wind turbines consists of a rotor shaft and an electrical generator at the apex of a tower and must be pointed into the wind. In this type small turbines are connected by a simple wind vane and large turbines are generally connected with a wind sensor that is attached with AC or DC servo motor. The efficiency of horizontal axis turbine is 50-60% and it also contains gear box mechanism which can regulate the speed of the turbine.

Vertical axis wind turbine is a type of wind turbine where rotor shaft is set transverse to the wind while the main components are located at the base of the turbine. This arrangement allows the generator and gearbox to be located close to the ground, facilitating service and repair.There are two models which HAWT and VAWT are done there are lift type and drag type

internet an integral part of their everyday life without which they are helpless. Internet of things (IoT) provides a platform that allows devices to connect, sensed and controlled remotely across a network infrastructure. In this paper we focus on home automation using smart phone and computer. The iot devices controls and monitors the electronic electrical and the mechanical systems used in various types of buildings. The devices connected to the cloud server are controlled by a single admin which facilitate a number of users to which a number of sensor and control nodes are connected. The admin can access and control all the nodes connected to each user but a single user can control only the nodes to which the user itself is connected. This whole system using Internet of Things (iot) will allow mobile devices and computers to remotely control all the functions and features of home appliances from anywhere around the world using the internet connection. The system designed is economical and can be expanded as it allows connection and controlling of a number of different devices.

Large wind turbines (with capacities of up to 6-8 MW) are widely installed in power distribution networks. Increasing numbers of onshore and offshore wind farms, acting as power plants, are connected directly to power transmission networks at the scale of hundreds of megawatts. As its level of grid penetration has begun to increase dramatically, wind power is starting to have a significant impact on the operation of the modern grid system. Advanced power electronics technologies are being introduced to improve the characteristics of the wind turbines, and make them more suitable for integration into the power grid. Meanwhile, there are some emerging challenges that still need to be addressed. This paper provides an overview and discusses some trends in the power electronics technologies used for wind power generation. First, the state-of-the-art technology and global market are generally discussed. Several important wind turbine concepts are discussed, along with power electronics solutions either for individual wind turbines or for entire wind farms. Some technology challenges and future solutions for power electronics in wind turbine systems are also addressed.

A major advantage of wind is that it is a clean and renewable form of energy. Its production of

electricity has no direct carbon emissions or air pollutants and does not consume water. Wind also has relatively low operations and maintenance costs after initial construction. However, wind energy also faces several challenges. Wind speeds can vary throughout the day and year,

2. HARDWARE REQUIREMENTS

A windmill is a structure that converts wind power into rotational energy by vanes called sails or blades Windmills were used throughout the high medieval and early modern periods.

There are two types of wind mills: 1.Horizontal windmill 2.Vertical windmill

Horizontal windmill(HAWT) : Horizontal axis wind turbines consists of a rotor shaft and an electrical generator at the apex of a tower and must be pointed into the wind.In this type small turbines are connected by a simple wind vane and large turbines are generally connected with a wind sensor that is attached with AC or DC servo motor. The efficiency of horizontal axis turbine is 50-60% and it also contains gear box mechanism which can regulate the speed of the turbine. The overview of basic windmill is shown in fig 2.2.

2.**Vertical windmill(VAWT):** Vertical axis wind turbine is a type of wind turbine where rotor shaft is set transverse to the wind while the main components are located at the base of the turbine.This arrangement allows the generator and gearbox to be located close to the ground,facilitating service and repair.There are two models which HAWT and VAWT are done there are lift type and drag type

12V DYNAMO:

A dynamo is a electrical generator that creates direct current using a commutator. Dynamos were the first electrical generators capable of delivering power for the industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternato,and the rotary coverter.Today the simple alternator dominate large scale power generation ,for efficiency, reliability and cost reasons.

ESP8266 NODE MCU:

NodeMcu is a low-cost open source IOT platform .It initially included firmware which runs on the ESP8266 Wi-Fi module espressif systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. It has a internal memory of 128 kb, storage of 4MB.

BATTERY:

Power bank also called “mobile battery”, “external battery”, “spare battery”, “digital charging companion”, and “charging stick”. It also has a very personal name: “mobile phone lover”. “**Power bank**” concept has been developed along with the rapid growth and popularization of digital products, and its definition is: portable power supply which is easy to carry with large capacity.

RELAY:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be ON or OFF

so relay have two switch position and they are double throw (changeover) switches.

LED'S: A **light-emitting diode** (**LED**) is a semiconductor lightt source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the bandgap of the semiconductor.

3. OBJECTIVE

The main objective of this work is to provide sophisticated control over the electric loads which are fed by renewable energy produced by wind mill.

Finds lot applications as back up energy source, domestic, commercial and industrial purposes, agriculture and irrigation.

Independence on commercial power supply.

The Idea of Project is to Generate Electricity by using one of the available renewable energy sources i.e., "Wind Energy".

The generated Power through this wind energy is fed to domestic loads ,which are smartly controlled further by using "IoT".

A prototype is developed regarding the Idea to control the small Electric loads in portable way.

4.WORKING EXPLANATION

The circuit is connected similarly as per the above diagram. As shown in the above fig 3.1 we can see that the power supply generated from the wind mill is given to the battery and to the loads through relays and the 3.3v dc power supply is given to node mcu module for the controlling action.

At first the due to the wind energy the blades start to rotate and power is generated in the 12v dynamo, next the generated power is given to the battery and the battery starts to charge parallel connection is made at the terminals of dynamo to the relays com terminals for the operation of the required loads, futher the power supply for the nodemcu is given properly from the battery,as soon as the blades rotate at the required rpm the led's begin to glow, Now we connect the mobile hotspot to the NODEMCU and wait till it gets connected which will be shown in the BLYNK mobile app, once the mobile gets connected to the module we can control the loads by switching through mobile phone and we can also insert timers in the application to the loads for the purpose energy saving. Once the wind gets turned off the loads get the supply from the power bank called as battery similarly when the loads are turned off the battery gets charged in the proper way from the generator.

Hence the generated power from the wind can be used for the domestic purposes as a back up source sufficiently in this way.

5.CALCULATIONS:

Power=k Cp ½ lb/ft3 AV^3

Where:

P = Power output, kilowatts

Cp = Maximum power coefficient, ranging from 0.25 to 0.45, dimension less (theoretical maximum = 0.59)

ρ = Air density, lb/ft3

A = Rotor swept area, ft2 or π D2/4 (D is the rotor diameter in ft, π = 3.1416)

V = Wind speed, mph

k = 0.000133 A constant to yield power in kilowatts. (Multiplying the above kilowatt answer by 1.340 converts it to horse- power [i.e., 1 kW = 1.340 horsepower]).

Air density:7.5lb/ft3

A=5.40ft2

V=50mph

By substituting the above values in the formula we got the power=33.6W.

From this power removing some losses we will get 20-25W of input wind power to the generator.

By conducting tests on dynamo with Rps on NO Load and Full load. We have obtained the output electric power between 5-6W with is sufficient for light loads and mobile charging purposes.

(The above values are taken from data sheet of table fan in google) .

Efficiency=5/20=25%(full load).

6. INSTALLATION

7.ADVANTAGES

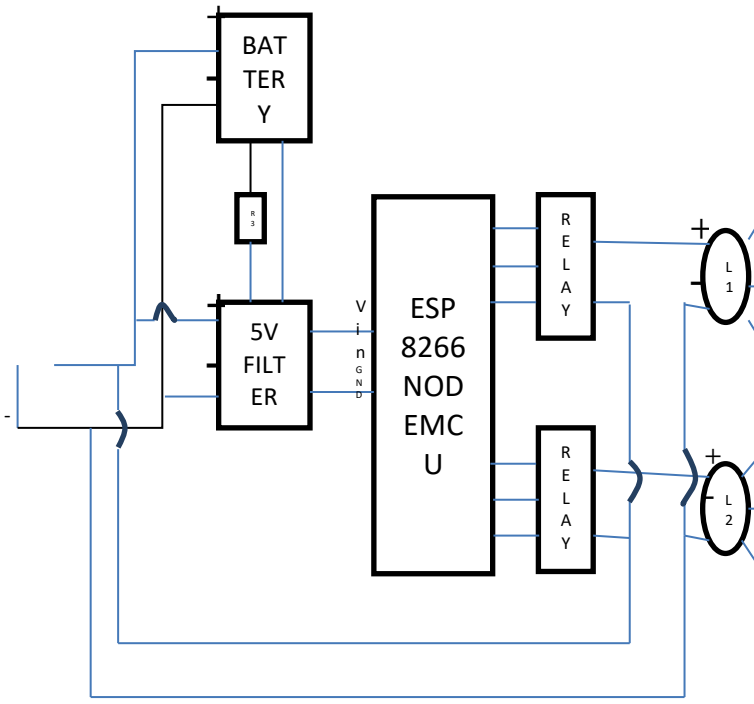
Finds lot applications as back up energy source, domestic, commercial and industrial purposes, agriculture and irrigation.

Independence on commercial power supply.

8.FUTURE WORK

1. In this project there is a great scope to modify it in different ways like increasing its operation by using less energy consuming components.
2. This can be modified by sensors.
3. Arduino programs can be replaced by better and variety of micro-controllers.
4. It can also be controlled by using remote controllers for necessary actions.
5. Even though our project worked perfectly and was functioning as initially planned, there are still a lot of improvements that can be made to make it more effectively.

9.BLOCKDIAGRAM



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10. RESULT

FIGURE TOP VIEW OF OUR PROJECT

FIGURE OUTPUT RESULT

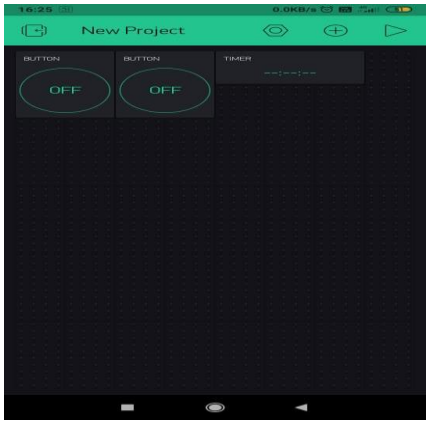

FIGURE BLYNK APPLICATION

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11. CONCLUSION

- The main objective of this work is to provide sophisticated control over the electric loads which are fed by renewable energy produced by wind mill.
- Finds lot applications as back up energy source, domestic, commercial and industrial purposes, agriculture and irrigation.
- Independence on commercial power supply

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