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INTELLIGENT WIRELESS SENSOR COMMUNICATION FOR GREEN BUILDINGS USING INTERNET OF THINGS

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ABSTRACT

The most important technology of 21st century is Internet of Things. Smart green House system is nothing but a system in which various sensors are used for controlling and monitoring various parameters inside a greenhouse such as temperature, fire, LDR sensors etc. The purpose of our project is to develop an easy, ease of installation, user-friendly to monitor and trace the values of parameters such as temperature, humidity, natural sunlight, fire, dust, vibration. These parameters are continuously monitored and controlled with an aim to control them for getting maximum possible plant increase and yield. Solar energy is a renewable source of energy, which is radiated by sun and has great potential. Solar energy reduces overall power generation capacity of the system. The output power reduces as much as by 50% if the solar panel is not cleaned for a month. Hence due to these advantages we make use of solar energy to generate power.

KEYWORDS IOT, sensors, solar panel, buzzers, Microcontroller.

1. INTRODUCTION

The Internet of Things (IOT) is a recent most widely used communication technology in which the objects of everyday life will be replaced by microcontrollers, transceivers for digital communication. IOT is a basic physical and organizational structure that includes physical devices, modern vehicles, buildings and also necessary electrical devices. IOT devices are connected to the internet and collect data from their environment, and then send this information to other applications for examination and decision making The IOT concept, hence, aims at making the Internet even more important and attractive. In addition, by providing easy approach and come in contact with a wide variety of devices such as home appliances, surveillance cameras, monitoring sensors, actuators, vehicles, and so on. The IOT will encourage the development of a number of applications that make use of large amount and variety of data generated by such objects to give new services to citizens, companies, and public administrations. This model truly finds application in many different areas, such as home automation, city transit applications, environmental and wastewater management applications, city lighting applications. Here we make use of Solar energy which is a renewable source of energy for the efficient use of power instead of using non-renewable source of energy.

2. RELATED WORK

With the growing usage of IOT, researchers are doing research about the development, security and enhanced facilities of wireless sensor communication for greenhouse building. In order to provide services like air quality, weather monitoring, the most basic parameters such as temperature, humidity and carbon dioxide have to be controlled. In this system monitoring is done by using Wireless Sensor Network (WSN) [1]. Shortage of power is affecting growth of the country's development. A renewable energy is used. Renewable energy includes solar power. Solar power is used for direct heating and cooling. Solar chillers with gas firing are used in urban houses. Solar pumps are also used for irrigation [2]. Smart greenhouse automation is a system in which a sensor named DHE11 is used to monitor parameters like temperature and humidity in green house. In this system, both manual and automatic method are used to control temperature and humidity [5]. The quick development in the population in urban areas. To improve the issues of city improvement, the use of IOT gadgets with each other over the web brings producing tremendous measure of information [7]. Here we are making use of solar energy as our power source. The cleaning of solar panel is necessary to obtain required solar power. The solar power needs to cleaned automatically. this method uses soft yellow nylon brushes to clean solar panel [3]. Electricity is the most basic needs of mankind. As the demand for electricity is increasing, there is a need for usage of renewable sources of energy. To make solar energy more useful, the output of solar panels must be increased. In this paper effects of dust and light intensity on the output of solar panels have been highlighted.

3. PROPOSED MODEL

The proposed project provides solution for rural and urban areas by making use of IOT which consists of sensors to collect data and then use these data to manage various parameters like reduce carbon emissions, detect earthquakes, recognizes noise pollution and air pollution, utilizes solar energy – a renewable source of

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energy and provides security alarm system. Instead of converting solar energy into electrical energy, we can use solar absorption chillers for domestic applications. Solar energy is one of the most

important renewable sources of energy. By constant soling and wind storm may reduce the solar panel efficiency. So, it is necessary to have proper and regular cleaning of the solar system. It can be solved by using soft powerful nylon brushes to clean the solar panel and fully automated cleaning system with/without water.

Fig 3.1: Block diagram of proposed system

a) ARDUINO ATMEGA 2560 MICROCONTROLLER
The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It consists of 54 digital input/output pins, 16 analog inputs, 4 UARTs, a 16MHz crystal oscillator, a USB connection, a power jack, an ISCP header and a reset button. It can be powered via the USB connection or with an external power supply. The ATMega has 2560KB of flash memory for storing code. Each of the 54 digital pins on the board can be used as an input or output using pinMode (), digitalWrite () and digitalRead () functions.

b) LCD (Liquid Crystal Display) DISPLAY

An LCD is a flat panel display that uses light modulating properties of liquid crystals. A 16*2 LCD displays 16 characters per line and has to registers namely, command register and data register. A command register stores the command instructions given to the LCD. A data register stores the data to be displayed on the LCD. It has 14 pins i.e., 8 data pins (D0-D7), 2 power supply pins (VSS and VDD), VEE (for contrast control), 3 control pins

(RS, R/W, E).

c) FIRE SENSOR
The module makes use of fire sensor and comparator to detect fire 2`upto a range of 1m. We can adjust the range and it has 3 pin easy interface connector. It works with an input voltage of +5v DC.

d) AIR QUALITY SENSOR
MQ135 semiconductor sensor has high sensitivity to Ammonia, Sulphide, CO_2, Benz steam and also to smoke and other harmful gases. The conductivity will be increased when the gas concentration increases. It is with low cost and suitable for air quality monitoring application. Detection range is upto 10-300 ppm for NH3, 10-1000 ppm for Benzene, 10-300 ppm for Alcohol.

e) VIBRATION SENSOR
Piezo sensor or Vibration sensor is made by the piezo element. The piezo electric sensor element is a transducer which converts pressure, force, strain, temperature into electric charge. It is designed for security practice, when vibration sensor alarm recognizes the movement or vibration, it sends a signal to control panel.

f) DUST SENSOR
The dust sensor used is GP2Y1010AU0F, which is an optical sensor. An infrared emitting diode and a phototransistor are diagonally arranged into this system. It can detect the dust in air which are reflected in the presence of light. Used in automatic running of application like air purifier and air conditioner with air purifying function.

g) SOUND SENSOR
Sound can be detected in Arduino when it exceeds the threshold value. Sound is detected through a microphone and can be uploaded to the LM393 op-amp. The sound range can be adjusted through an on-board potentiometer. When the sound level exceeds the set point, an LED on the module is illuminated ant the output is sent low.

h) TEMPERATURE SENSOR
DHT11 temperature and humidity sensor complex with a calibrated digital signal output. We can use signal acquisition technique in temperature and humidity sensors. It ensures high
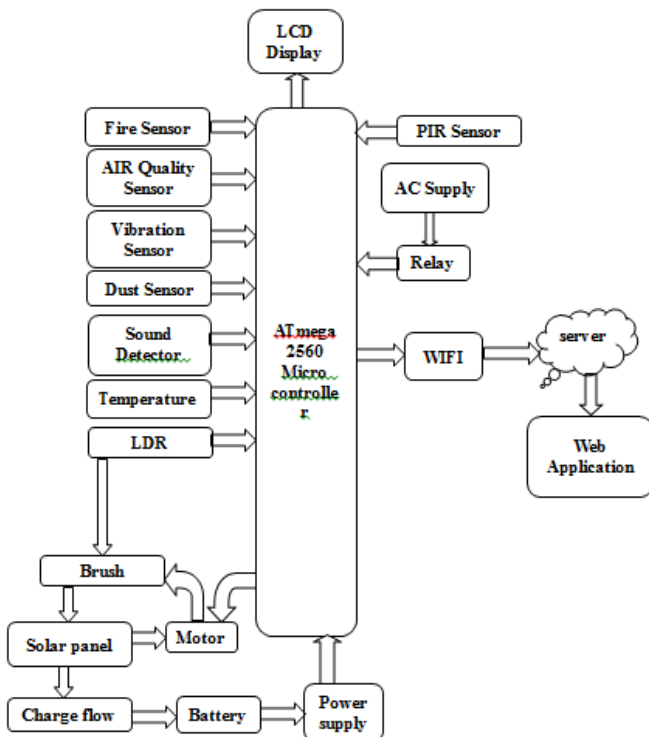
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reliability and excellent long-term stability. It connects to high performance 8-bit microcontroller.

i)LDR (Light Controlled Variable Resistor) BASED RELAY BOARD

It is used to turn on/off circuits, lights, fans etc. when there is change in incident light intensity in LDR sensor part. The resistance of LDR decreases with increase in incident light intensity (i.e., photoconductivity). LDR are made from semiconductor materials to enable them to have their light sensitive properties.

j) PIR (Passive Infrared) SENSOR

It is an electronic sensor that measures infrared light radiating

objects in its field. These radiations are not visible to a human eye, but it can be detected using some electronic devices. It detects the change in infrared radiation of warm-blooded moving object in the detection range.

k) RELAY

It is an electromagnetic switch which is operated with a small current which can make a large electric circuit on and off. It is necessary to control a high voltage circuit with a low power circuit. The heart of relay is an electromagnet.

l) DC MOTOR

L293D is a popular motor driver IC that is usable from 6-12V and up to 1A total output current. It is a class of rotary electrical machines that converts direct electrical energy into mechanical energy. All DC motors have some internal mechanism, like electromechanical/electronic to periodically change the direction of current flow of the motor clockwise and anticlockwise.

m) SOLAR POWER SUPPLY

Solar panels are those devices which are used to absorb the sun rays and convert them into electricity or heat. A solar panel is actually a collection of solar (photovoltaic) cells, which can be used to generate electricity through photovoltaic effect. Most of the solar panels are made up of crystalline silicon solar cells and arranged in a grid-like pattern. Installation of solar panels in home helps in reducing the harmful emissions of greenhouse gases and thus helps to reduce global warming. In a year, their effectiveness decreases only about one or two percent.

- ## RACK AND PINION TECHNIQUE

A rack and pinion are a type of linear actuator that consists two gear systems i.e., a circular gear (pinion) engaging a linear gear (rack), which converts rotational motion into linear motion. It has linkages (teeth) that mesh with other gear teeth, allowing force to be fully transferred without slippage. We are using this technique to clean the solar panel.

4. ADVANTAGES AND DISADVANTAGES

Advantages

[a] The proposed system plays a major role in the field of agriculture.
[b] Easy to implement.
[c] It increases the security.
[d] It gives the better result with less errors.

Disadvantages

[a] System working may be affected for low networking conditions.

5. APPLICATIONS

[a] Security alerting system like sensors temperature humidity.

[b] Low power consumption, Variation in temperature then only home appliance gets ON.
[c] Industrial application: Sound pollution, dust pollution.
[d] Civil application: Deformation and vibration sensor get alert for earth quake.
[e] Electrical department: LDR street light automatic get ON/OFF according to sunlight.

6. PROJECT WORKING

The working of the above block diagram is as explained here. In the beginning the system is initialized to zero so that no garbage values will affect the system functioning. The project is designed and programmed in such a way that it keeps monitoring the various values like accidental fire, air quality and dust in the surrounding, detection of the earthquake(vibration) and abnormal sound, detection of the presence of moving objects in the restricted area, and displaying report in LCD screen and updating the data in the web application(Adafruit IO) through Wi-Fi with the help of the Node MCU, and indicating the above parameters through buzzer and taking few actions like switching on the fan for higher temperature and if more dust is present. Although battery is used as the alternative power supply, the main power source used here is solar power supply where the solar panel is used as photovoltaic device that converts the light energy into electrical energy. Although it is a non-renewable source of energy, the solar panel must have cleaned periodically when we experience the low power being produced by solar panel, hence in the proposed model the solar panel is cleaned whenever the low output than the threshold is obtained from it by the brush using rack and pinion technique during day hours.

7. EXPERIMENTAL RESULT
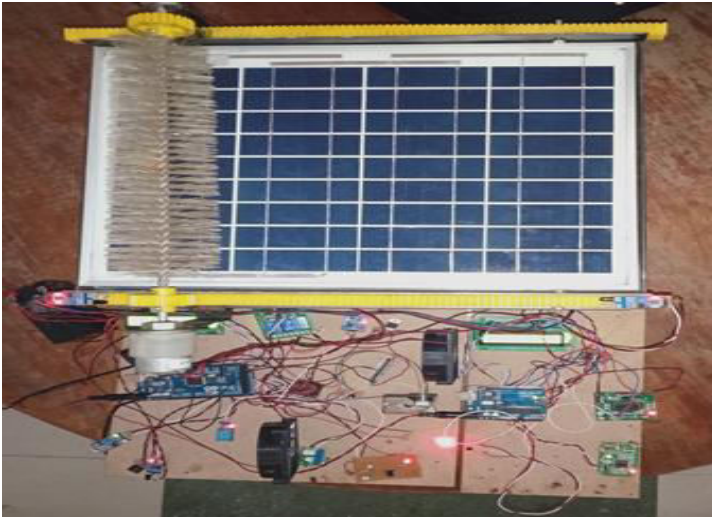
8. CONCLUSION

The proposed system provides solution for rural and urban areas by making use of IOT which consists of sensors to collect data and then use these data to manage various parameters like reduce carbon emissions, detect earthquakes, recognizes and reduces the major parameters like noise pollution and air pollution, utilizes solar energy a renewable source of energy and provides security alarm system. As we move into the future, technology becomes even more advanced, the majority of capital cities will become smart cities. As smart city uses IOT, data and technology to streamline services to make a city more connected, efficient, manageable and cost effective.

9. FUTURE SCOPE

As we move into the future, technology becomes even more advanced, the majority of capital cities will become smart cities. As smart city uses IOT, data and technology to streamline services to make a city more connected, efficient, manageable and cost effective.

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