Single phase solar induction motor control and auto power mode over IOT

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ABSTRACT
Power plays a great role wherever man lives and works. The living standard and prosperity of a nation vary directly with the increase in the use of power. The electricity requirement of the world is increasing at an alarming rate due to industrial growth, increased and extensive use of electrical gadgets. According to world energy report, we get around 80% of our energy from conventional fossil fuels like oil (36%), natural gas (21%) and coal (23%). It is well known that the time is not so far when all these sources will be completely exhausted. So, alternative sources should be used to avoid energy crisis in the nearby future. The best alternative source is solar energy. A solar panel is a large flat rectangle, typically somewhere between the size of a radiator and the size of a door, made up of many individual solar energy collectors called solar cells covered with a protective sheet of glass. The cells, each of which is about the size of an adult's palm, are usually octagonal and colored bluish black. Just like the cells in a battery, the cells in a solar panel are designed to generate electricity; but where a battery's cells make electricity from chemicals, a solar panel's cells generate power by capturing sunlight instead. They are sometimes called photovoltaic cells because they use sunlight ("photo" comes from the Greek word for light) to make electricity (the word "voltaic" is a reference to electricity pioneer Alessandro Volta). The system depending on the selection switch status either directly runs the motor through inverter through solar power or stores the energy to a battery and then runs the motor through the inverter.
AIM: The project aims at designing a system which makes the induction motor running through solar energy possible and also switches the solar panel based on day and night.

INTRODUCTION
In general, previous days IOT is used with wired model networks that can be transmitted and received the information through wire networks only. Recent IOT technology modified and well developed having modern sensors and protective elements with this we can transmit the information using wireless communications. Thus resulting in a new concept of IOT technology was introduced earlier and received the more benefits over the last few years[1]. In every day human life is related to the advancement technology devices like smart phones and tablets are wide spreading over the world sowe are going to interfacing the IOT technology with these devices then having the more benefits and those are saving of time and easy to control[3]-[4]. Use of IOT not only in the home appliances but also in other major fields such as a smart city, smart health care, smart car, smart energy systems. Solar energy is becoming a significant solution to renewable energy supply for future needs. Increased rooftop solar systems are integrated into networks such as grids and industrial locations, and there is a growing need to track the real-time generation of power from solar power plants and locate fault points, and to improve the overall output of solar systems to achieve good grid stability. Power generation from solar panels is variable due to variations in solar irradiance, temperature and other components[7]-[8]. So that we can assemble the machines automatically and then use advanced IOT technology systems. Based on various sensors and microcontroller devices with these components, we can easily track wireless networks and eliminate the faults and hazards associated with modern technology approaches. So that the cost functions of the device are therefore

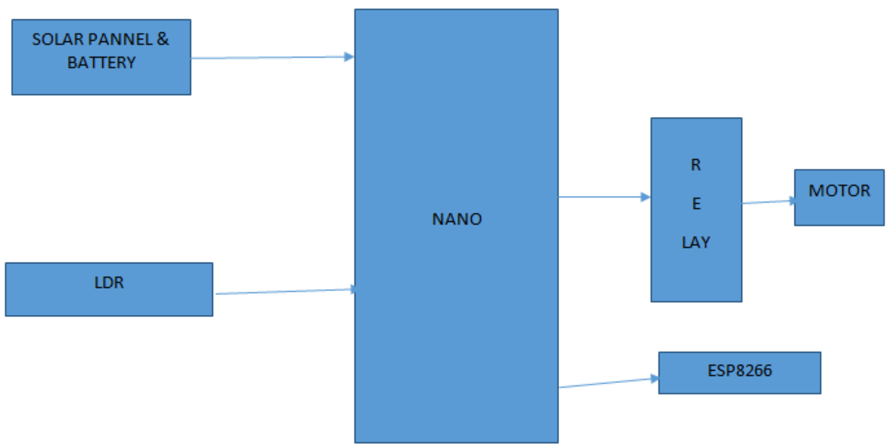
much smaller than those of the previous control systems[5]-[6]. A predictive analysis that provides information on the faults and maintenance conditions of pv systems is very relevant. What type of devices are the measurement devices and protective equipment are most appropriate for solar photovoltaic systems. Remote monitoring and control of pv systems focused on wireless networking devices such as Zigbee technology and wi-fi technology [2]-[10]. There's a gap in the distance between these units. Zigbee has a smaller range related to Wi-Fi. The Wi-Fi technology is used to run the region below 2.4GHz and to have a fast data rate. This technology operates under the micro grid architecture, and if we need a high level of infrastructure then we need cloud computing technology that is really useful. At present, a number of solar photovoltaic systems has been set up to operate this system, and we are using wireless communication devices such as GSM and Bluetooth, and Zigbee maintains these communication networks for data transmission and data reception, but there are some disadvantages associated with high operation and maintenances costs which restrict the improvement of home appliances. In order to reduce these impacts, PV systems based on IOT can be changed by monitoring and controlling. The power generation system with its various parts, such as solar panels, temperature sensors, voltage measurement devices, relays, current measurement devices and diesel generators, and these devices communicate with the microcontroller[9]-[22]. Analysis of the data obtained using the database built for these various measuring control devices

LITERATURE REVIEW

Solar inverter is a critical component in a solar energy system. It converts DC power output into AC current that can be fed into the grid and directly influences the efficiency and reliability of a solar energy system. In most occasions, 220VAC and 110VAC are needed for power supply. Because direct output from solar energy is usually 12VDC, 24VDC, or 48VDC, it is necessary to use DC-AC inverter in order to beable to supply power to 220VAC electronic devices. Inverters are generally rated by the amount of AC power they can supply continuously. [3] In general, manufacturers provide 5 second and ½ an hour surge figures which give an indication of how much power is supplied by the inverter. Solar inverters require a high efficiency rating. Since use of solar cells remains relatively costly, it is paramount to adopt high efficiency inverter to optimize the performance of solar energy system.High reliability helps keep maintenance cost low. Since most solar power stations are built in rural areas without any monitoring manpower, it requires that inverters have competent circuit structure, strict selection of components and protective functions such as internal short circuit protection, overheating protection and overcharge protection. Wider tolerance to DC input current plays an important role, since the terminal voltage varies depending on the load and sunlight. Though energy storage batteries are significant in providing consistent power supply, variation in voltage increases as the battery's remaining capacity and internal resistance condition changes especially when the battery is ageing, widening its terminal voltage variation range. In mid-to-large capacity solar energy systems, inverters' power output should be in the form of sine waves which attain less distortion in energy transmission. Many solar energy power stations are equipped with gadgets that require higher quality of electricity grid which, when connected to the solar systems, requires sine waves to avoid electric harmonic pollution from the public power supply.[3] How Inverters Work: There are three major functions an inverter provides to ensure the operation of a solar system: Inversion: The inversion process converts DC power generated by the PV array to AC power. Except for the use in small offgrid systems, directly using DC power from PV array is not practical. Although many home appliances use DC power, large loads and the electrical network use AC power to allow long distance power distribution and minimize the energy loss. Maximum Power Point Tracking: Maximum power point tracking is a technique solar inverters use to allow modules to produce all the power they are capable of. Sunlight intensity varies significantly depending on the time and location, and therefore variation in cell temperature and solar irradiation, temperature and total resistance all affect the design of inverter as well as system.[7] Grid Disconnection: As required by the safety standard UL 1741 and system intersection standard IEEE 1547, all inverters used in systems tied to grid must disconnect from the grid if the AC line voltage or frequency reaches above or below stated limits in the standards. The inverter must also activate and execute a shutdown protocol on the system when the grid is no longer present. These protections eliminate a hazard caused by continuous injection of voltage into the disconnected wire or switch gear. Currently, over 900 million people in various countries don't have drinkable water available for consumption. Of this total, a large amount is isolated, located on country areas where the only water supply comes from the rain or distant rivers. In such places, the lack of availability of electric power rules out the pumping and treating of water through conventional systems. One of the most efficient and promising way to solve this problem is the use of pumping and water treatment systems supplied by photovoltaic (PV) solar energy. Such systems aren't new, and are already used for more than three decades. But until recently the majority of the available commercial converters are based on an intermediate storage system performed with the use of batteries or DC motors to drive the water pump. The batteries allow the system to always operate at its rated power even in temporary conditions of low solar radiation. This facilitates the coupling of the electric dynamics of the solar panel and the motor used for pumping. Generally, batteries used in this type of system have a low life span, only two years on average, which is extremely low compared to useful life of 15 years of a photovoltaic module. Also, they make the cost of installation and maintenance of such systems substantially high. Furthermore, the lack of batteries replacement is responsible for total failure of such systems in isolated areas this type of system normally uses low-voltage DC motors, thus avoiding a boost stage between the PV module and the motor. Unfortunately, DC motors have low efficiency and high maintenance cost and are not suitable. For such applications the use of a three phase induction motor, due to its high degree of robustness, low cost, higher efficiency and lower maintenance cost compared to other types of motors. These requirements make necessary use of a converter with features high efficiency; low cost; autonomous operation; robustness; and high life span.

IMPLEMENTATION

BLOCK DIAGRAM



EMBEDDED SYSTEMS

Many embedded systems have substantially different design constraints than desktop computing applications. No single characterization applies to the diverse spectrum of embedded systems. However, some combination of cost pressure, long life-cycle, real-time requirements, reliability requirements, and design culture dysfunction can make it difficult to be successful applying traditional computer design methodologies and tools to embedded applications. Embedded systems in many cases must be optimizedfor life-cycle and business-driven factors rather than for maximum computing throughput. There is currently little tool support for expanding embedded computer design to the scope of holistic embedded system design. However, knowing the strengths and weaknesses of current approaches can set expectations appropriately, identify risk areas to tool adopters, and suggest ways in which tool builders can meet industrial needs. If we look around us, today we see numerous appliances which we use daily, be it our refrigerator, the microwave oven, cars, PDAs etc. Most appliances today are powered by something beneath the sheath that makes them do what they do. These are tiny microprocessors, which respond to various keystrokes or inputs. These tiny microprocessors, working on basic assembly languages, are the heart of the appliances. We call them embedded systems. Of all the semiconductor industries, the embedded systems market place is the most conservative, and engineering decisions here usually lean towards established, low risk solutions. Welcome to the world of embedded systems, of computers that will not look like computers and won't function like anything we are familiar with.

CLASSIFICATION

Embedded systems are divided into autonomous, realtime, networked & mobile categories.

Autonomous systems

They function in standalone mode. Many embedded systems used for process control in manufacturing units& automobiles fall under this category.

Real-time embedded systems

These are required to carry out specific tasks in a specified amount of time. These systems are extensively used to carry out time critical tasks in process control.

Networked embedded systems

They monitor plant parameters such as temperature, pressure and humidity and send the data over the network to a centralized system for on line monitoring.

Mobile gadgets

Mobile gadgets need to store databases locally in their memory. These gadgets imbibe powerful computing & communication capabilities to perform realtime as well as nonrealtime tasks and handle multimedia applications. The embedded system is a combination of computer hardware, software, firmware and perhaps additional mechanical parts, designed to perform a specific function. A good example is an automatic washing machine or a microwave oven. Such a system is in direct contrast to a personal computer, which is not designed to do only a specific task. But an embedded system is designed to do a specific task with in a given timeframe, repeatedly, endlessly, with or without human interaction.

Hardware

Good software design in embedded systems stems from a good understanding of the hardware behind it. All embedded systems need a microprocessor, and the kinds of microprocessors used in them are quite varied. A list of some of the common microprocessors families are: ARM family, The Zilog Z8 family, Intel 8051/X86 family, Motorola 68K family and the power PC family. For processing of information and execution of programs, embedded system incorporates microprocessor or micro- controller. In an embedded system the microprocessor is a part of final product and is not available for reprogramming to the end user. An embedded system also needs memory for two purposes, to store its program and to store its data. Unlike normal desktops in which data and programs are stored at the same place, embedded systems store data and programs in different memories. This is simply because the embedded system does not have a hard drive and the program must be stored in memory even when the power is turned off. This type of memory is called ROM. Embedded applications commonly employ a special type of ROM that can be programmed or reprogrammed with the help of special devices.

Introduction to the Arduino NANO Board

The Arduino Nano, as the name suggests is a compact, complete and bread-board friendly microcontroller board. The Nano board weighs around 7 grams with dimensions of 4.5 cms to 1.8 cms (L to B). This article discusses about the technical specs most importantly the pinout and functions of each and every pin in the Arduino Nano board.

Arduino Nano has similar functionalities as Arduino Duemilanove but with a different package. The Nano is inbuilt with the ATmega328P microcontroller, same as the Arduino UNO. The main difference between them is that the UNO board is presented in PDIP (Plastic Dual-In-line Package) form with 30 pins and Nano is available in TQFP (plastic quad flat pack) with 32 pins. The extra 2 pins of Arduino Nano serve for the ADC functionalities, while UNO has 6 ADC ports but Nano has 8 ADC ports. The Nano board doesn't have a DC power jack as other Arduino boards, but instead has a mini-USB port. This port is used for both programming and serial monitoring. The fascinating feature in Nano is that it will choose the strongest power source with its potential difference, and the power source selecting jumper is invalid.

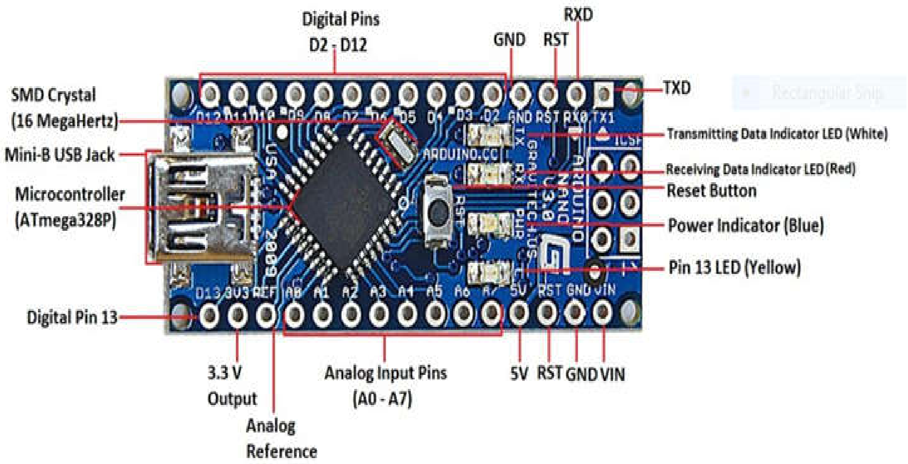


Figure 3.3.2 Arduino nano Board

LCD (Liquid Cristal Display)
Introduction:

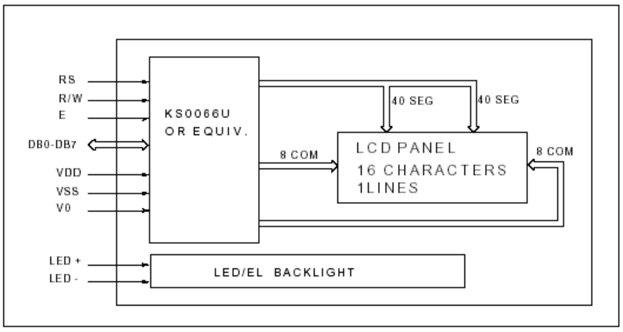
A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the contollers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

Shapes and S

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4-bit data bus it only requires the supply lines plus 6 extra lines(RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

Electrical block diagram:



SOFTWARE DESCRIPTION

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P. It offers the same connectivity and specs of the UNO board in a smaller form factor.

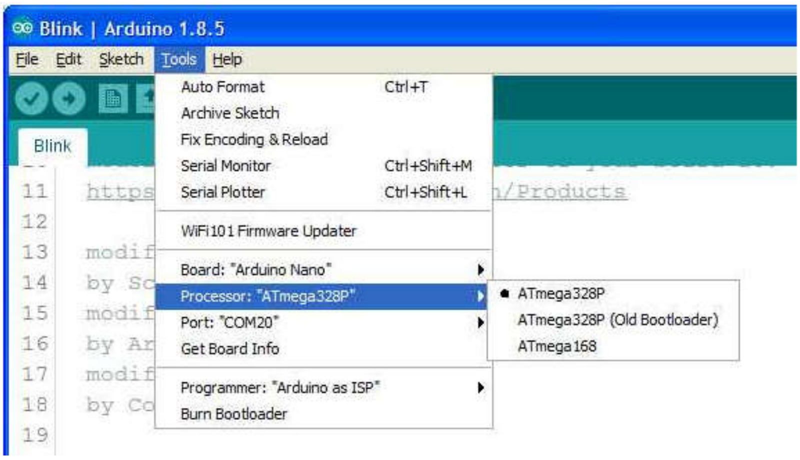
The Arduino Nano is programmed using the Arduino Software (IDE), our Integrated Development Environment common to all our boards

Use your Arduino Nano on the Arduino Desktop IDE

If you want to program your Arduino Nano while offline you need to install the Arduino Desktop IDE To connect the Arduino Nano to your computer, you'll need a Mini-B USB cable. This also provides power to the board, as indicated by the blue LED (which is on the bottom of the Arduino Nano 2.x and the top of the Arduino Nano 3.0).

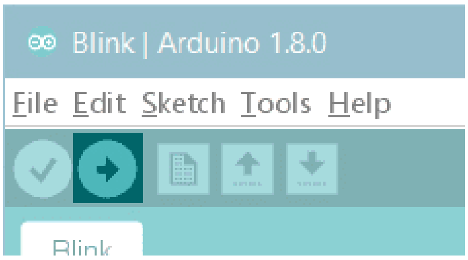
Select your board type and port

Select Tools > Board > Arduino AVR Boards > Arduino Nano.



Upload and Run your first Sketch

To upload the sketch to the Arduino Nano, click the Upload button in the upper left to load and run the sketch on your board:



Wait a few seconds - you should see the RX and TX LEDs on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar

CONCLUSION

Now a days producing and regulating power is an important task in the study of the power system. In this paper introduces a solar power generation system with IOT technology. The proposed system is used to regulate the load as per the availability of the power with the help of controller and online data monitoring system is IOT, sensors and relay devices. The measurement of voltage and current circuits are important for the consumption of load values. In this developed system, the wireless devices are used to send and receive information from IOT devices, which primarily measure power and recognize faults in the system with safety precautions.

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