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Solar Energy Monitoring System with LPC 2148 Processor

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Abstract: ***Renewable Energy (RE) is making a noticeable impact in the lives of rural and urban masses. Also recent advances in the communication technology especially wireless network and sensor's are used bit which is having a certain disadvantages also. Solar parameter monitoring has become a crucial question around the whole world. Traditionally, remote parameter sensing satellites is widely used to monitor the various parameters quality for voltage, current, temperature and humidity.[6] To improve the efficiency of solar systems, it is very important to get more information about solar panel performance and tracking. In the serial communication after receiving the data the data format is analyzed to determine whether the data is alarm data serial communication interfacing is shown in the flow chart as shown. The renewable energy also called the green energy, has gain very much importance nowadays. Green energy can be recycled, much like solar energy, water power, wind power, biomass energy, terrestrial heat, temperature difference of sea, sea waves, morning and evening tides.[7] In this paper real time data monitoring of solar power system is performed by combination LPC2148 ARM7 Processor and Wireless Serial Communication RF Modem of 2.4 GHz. The ARM7 processor is used for data automatic analysis, processing, displaying and saving automatically whereas 2.4 GHz wireless communication device is responsible for real time data transmission to the monitoring centre. This system monitors Voltage, Current, Humidity And temperature and displays this parameters to the monitoring system where data is saved in SQL database and for displaying purpose VB 6.0 is used.***

Keyword: Solar Power, LPC 2148 ARM7 Processor, 2.4 GHz wireless Transmitter and display unit

1. Introduction

With the limited resources of non renewable energy sources and with their increased consumption it has become necessity to move towards renewable energy sources like solar power and wind power. Out of which solar power has emerged as the important renewable energy resource in last some years so to improve the utilization of solar energy resources, real time wireless solar power monitoring systems has become important now a days. As such systems are implemented using wired communication but there some shortcomings while collecting data from remote places. So to overcome these problems we have introduced wireless system to monitor parameters like voltage, current, humidity and temperature using advanced LPC 2148 ARM7 processor. These monitored parameters will be transmitted to sunrom 2.4GHz RF transmitter which will be then transmitted to local monitoring station i.e. PC and if any of monitored parameters exceeds threshold value then that will be indicated by on PC as well as alarm will be generated.

2. Systematic Review

Currently, most residential solar panel systems only provide energy information on a monthly basis and do not allow individual panel monitoring. PV solar panel has at least 25 years warranty, whereas inverters only come with an 8-10 years warranty [2]. That means that sometime in the 8-10 years range the inverter will die and the system will stop producing energy. With a monitoring system in place the installer or homeowner will know immediately that the system has been compromised. Otherwise it could be weeks or months before the home owner looks at their energy usage statement from their utility company and realizes that their solar electricity system is no longer producing energy [2].Monitoring and troubleshooting like one of large system of solar panel it is very difficult and time consuming process a system is a regularly monitor each panel that report a failure or function of promptly [5].in our system we save the time as well as reduces man power [2].

3. System Description

Hardware Design:

The system comprises of two part one is a transmitter side (Processor will sense the input and RF Transmitter 2.4 GHZ TX will transmit the sign and monitoring application receiver).

The hardware system signal conditioning circuit:

1. LPC2148 will sense the input signal coming from input side after every 3 seconds.
2. This data will given to the radio frequency transmitter firstly will check it as the data is whether alarm data or not.
3. If it is either a alarm data then it will come to the system initialization and if it's not will send to the further step.
4. Finally monitoring section like a PC will get that data for the monitoring purpose near about a distance of 30 meters.

Solar power monitoring system collects the parameter like humidity, temperature, voltage and current of solar power generation equipment and provides information to the master board by cable, the core processor LPC2148 is used for data automatic analysis, processing, displaying and saving purpose, if any of the monitored parameters exceeds threshold value then alarm will be generated and same will be indicated on monitoring system [1].The whole system design is shown in Figure 1.

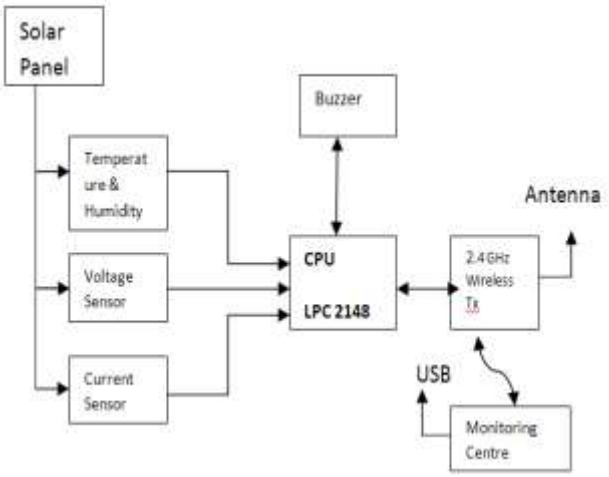


Figure 1: Block Diagram of solar system

We have used SUNROM 2.4GHz transceiver for wireless communication. At the monitoring centre which is Laptop based system where the received data is displayed in graphical way as well as it be will saved in the database. For graphical representation we have used VB6.0 & for database SQL server [2].This system continuously monitors the various parameters like temperature, humidity, voltage & current of the solar panel and when any of the parameter exceeds threshold value buzzer will be generated and parameters will be displayed on monitoring system The main feature of this mechanism is continues monitoring of solar system parameters from a distance up to 30 meters over a wireless communication [3].

3.1 ARM7 LPC 2148 Processor

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate[1]. Due to their tiny size and low power consumption, LPC2148 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 KB up to 40 KB, make these devices very well suited for communication gateways and protocol converters, soft modems, providing both large buffer size and high processing power. Other problems are arrives when solar power monitoring system is not in use and that problems are Related to the battery charging and discharging states. The master control module which has the LPC2148 ARM 7microcontroller which is designed to acquire and display real-time performance parameters

3.2 (2.4 GHZ Wireless Transceiver)

SUNROM RF modem can be used for application that needs two way wireless data transmission [3].It features adjustable data rate and reliable transmission distance. Communication protocol is self-control and completely transparent to user interface. The modem can be easily embedded to our current design so that wireless communication can be easily set up over distance of 30 meter range. This module works in half-duplex mode. Means it can either transmit or receive but not both at same time. After each transmission, module will be switched to receiver mode automatically. The LED for Transmission and Receiving indicates whether IC is currently receiving or transmitting data.

Software Design:

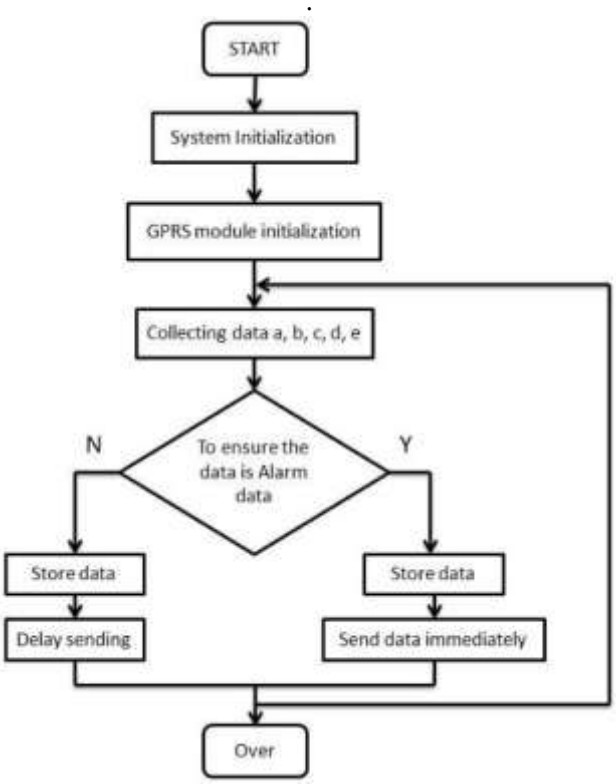
The software implementation of this system can be divided in to two main parts. At transmitter side the software implementation is done on LPC2148 ARM7 processor. The software used for the ARM7 processor is Keil software (µvision4). The whole programming at transmitter side is written in Embedded C language. At receiver side, software implementation is based onVB6.0 and the received data is saved in SQL database. With the help of this two programming base we can get the result for the solar power monitoring system for a specific distance along.

Observations:

Parameters	Result
Temperature	31 Degree
Humidity	25 RH
Current	4 Milli Amps
Voltage	12 Volts

Flow Chart:

Figure Main flow diagram of system



4. Conclusion

The solar power wireless monitoring system is one of the advanced technologies to monitor a different parameters like, temperature, humidity, voltage and current parameters.

RF 2.4 GHZ wireless transmission is used to the ARM7 TDMIS system achieve an accurate and rapid transmission of the parameter in solar power generation system. Thus by using with such system we can monitor the important parameter require for system and avoid the further damages of system.

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