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Sensor Movement Based Sensor Switching for Data Acquisition

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Abstract— This system aims at building an efficient and automatic power survey system, which is capable of monitoring the parameters which are present in real time industrial environment. The system makes use of RF based communication. The purpose of this system is design and construct a sensor movement controlled sensor switching system for physically challenged. The user can wear this device to head and also to the other moving parts of the body with the simple movement's, person can control sensor switching and display on pc by using MEMS technology, User can control those sensors by using wireless RF technology.

Key Words— MEMS-Micro Electronic Mechanical Sensor.

1. INTRODUCTION

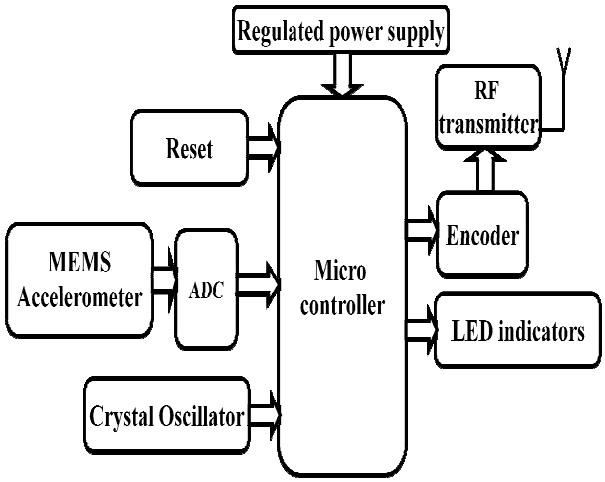
Recent advances in wireless communication and electronics have enabled the development of low-cost, low power, multifunctional sensor nodes, which consist of sensing, data processing and communication components, leverage the idea of sensors. Sensor network represent a significant improvement over traditional sensors The sensors, which we are employing, are meant to monitor parameters that we come across in industrial environment. There is a requirement for very sensitive interfacing between the sensors & controllers. These interfacing protect the controller from damage. We also make use of the ADC module which available internally in a microcontroller to read the input from these sensors. RF Communication ranges in between 30 KHz to 300 GHz. RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. RF transceiver modules have both transmitter and receiver sections within it. And the data received from RF is stored in microcontroller and analyzed through any display device (like PC, LCD).

2. LITERATURE SURVEY

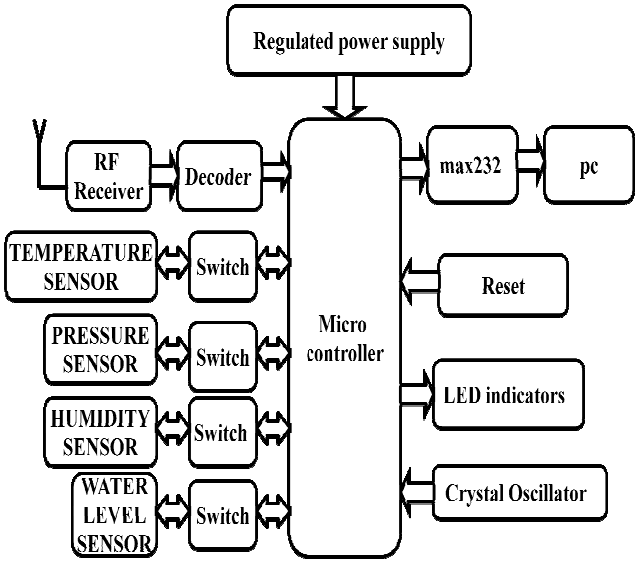
Sensor movement based sensor switching for data acquisition is modified version wireless sensor network where in data is acquired directly from the environment by sensors and then analyzed through PC .Sensors are enabled through individual switches. But in this system instead of switches we use a sensor where the sensors are enabled based on the movement of the switching sensor and then data is acquired and analyzed. This system aims for people who are handicapped that is just moving sensor, other sensors are turned on and off and environmental parameters are analyzed.

3. BLOCK DIAGRAMS

TRANSMITTER



RECEIVER



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MEMS ACCELEROMETER

Micro-Electro-Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology. MEMS are also referred to as micro machines or Micro Systems Technology – MST. And also called as accelerometer. Micro electro mechanical sensors form a class of sensors which we here loosely define as sensors which are sensitive in one way or another to mechanical properties and which are made by micromachining technology.

RF-TRANSCEIVER

The RF Transceiver uses RF modules for high speed data transmission. The microelectronic circuits in the digital-RF architecture work at speeds up to 100 GHz. The objective in the design was to bring digital domain closer to the antenna, both at the receive and transmit ends using software defined radio(SDR).The software-programmable digital processors used in the circuits permit conversion between digital base band signals and analog and RF. Some transceivers are designed to allow reception of signals during transmission periods. This mode is known as full duplex, and requires that the transmitter and receiver operate on substantially different frequencies so the transmitted signal does not interfere with reception.

TEMPERATURE SENSOR

The Temperature Sensor LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

HUMIDITY SENSOR

It is a device used to measure the humidity of air or any gas in a given area. It can be used in both indoors and outdoors. The humidity sensor is able to assists people's daily life in an invisible way. For example, to prevent the paper jam problem, the inside humidity sensor would detect the relative humidity at first, then the microchip would determine whether to warm up the printer to reduce the water vapour.

PRESSURE SENSOR

Pressure sensors are used for control and monitoring in thousands of everyday applications. Pressure sensors can also be used to indirectly measure other variables such as fluid/gas flow, speed, water level, and altitude.

WATER LEVEL SENSOR

This is a simple basement type water level sensor that trips an alarm to announce excess water in the basement.

4. SYSTEM WORKING

MEMS is a Micro Electro Mechanical Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tilt and operates the electrical devices and announces the basic needs depending on tilt. For example if the tilt is to the forward then the device will be "ON" for the first time then next time it will be "OFF". In the same way, if the tilt is to the left side then another device is going to be controlled. The tilt is in left side or right side direction the related need will be announced. This device is very helpful for paralysis and physically challenged persons. This system makes use of a Transistor for switching the devices which is programmed, with the help of embedded C instructions. This microcontroller is capable of communicating with transmitter and receiver modules. The MEMS based sensor detects the tilt and provides the information to the microcontroller (on board computer) and the controller judges whether the instruction is right movement or left movement instruction and controls the operation respectively.

RF Communication ranges in between 30 KHz to 300 GHz. RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength. RF transceiver modules have both transmitter and receiver sections within it. This system consists of two Microcontroller based motherboards one dedicated with the electrical devices and the other at the display end. This display unit is provided for the user interface to view the device status. The controller at this display unit is also interfaced with a RF transceiver. The RF transceiver receives the information from the other microcontroller and feds it to the controller to which it is connected. The controller takes the responsibility to display the data into the PC. The motherboard at the other end is provided with few sensors such as voltage sensor, current sensor and temperature sensor. These sensors monitor the load conditions of the device to which it connected and provides the same to the controller. The controller feds it to the RF transceiver and the transceiver encodes them and transmits it as an RF signal. The transceiver at the transceiver end decodes the information and provides it to the controller for which it is interfaced. The sensors, which we are employing, are meant to monitor very high voltage devices that we come across in industrial environment. There is a requirement for very sensitive interfacing between the sensors, controller and the high voltage devices. These interfacings protect the controller from damage. We also make use of the ADC module which available internally in a microcontroller to read the input from these sensors.

5. ADVANTAGES

1. Devices can be operated wirelessly using RF communication.
2. Feedback of the devices being operated is present.
3. Efficient and low cost design.
4. Low power consumption.
5. Real time monitoring and controlling.

6. APPLICATIONS

1. This system can be implemented in industries.
2. This system can be used to monitoring and controlling the home appliances.

3. This system can be used as a head movement controlled switching for physically challenged.

7. RESULT

This system was designed such that the devices can be monitored and also controlled wirelessly using RF communication and the status of the devices are displayed on PC.

8. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the system has been successfully implemented.

9. FUTURE SCOPE

This system is mainly intended to operate the devices like fans, lights, motors etc.., through wireless communication based on RF transceiver. The system has temperature, current, voltage sensors, frequency measuring unit and the devices to be operated through the switches like Relay which are interfaced to the micro controller. In future we can use this project in several applications by adding additional components to this system. This system can be extended by using GPRS technology, which helps in sending the monitored and controlled data to any place in the world. The temperature controlling systems like coolant can also use in places where temperature level should be maintained.

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