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Data Logger System for Green House Monitoring

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Abstract - The objective of this work is to use data logging for temperature measurement. In order to meet the above requirements, a low cost, versatile, portable data logger is designed for green house. A microcontroller based temperature data logger has been developed for measuring temperature, humidity, moisture and at different input channels of ADC. The device is designed to receive data from temperature humidity, moisture and light sensors and to store the results on only memory in PC for post process analysis. An integrated Liquid crystal display (LCD) is also used for real time display of data acquired from various sensors.

Keywords **- Data Logger, ATMEGA 8A Microcontroller, ADC, LCD.**

1. Introduction

The processes to collect, analysis and store the data for later use is called logging. It is a process to record events during a test or measurement with the use of a system or a product. The human brain and its memory, the nature's creation, no doubt is the best data logging mechanism. Where there is the need to collect information faster than a human, data loggers can possibly collect the information and in cases where accuracy is essential. A data logger is a device that can be used to store and retrieve the data. Data logging also implies the control of how sensor collects and analyzes the data. It is commonly used in scientific experiments and in monitoring systems. Data loggers automatically make a record of the readings of the instruments located at different parts of plant.

The type of information recorded is determined by the user. Their advantage is that they can operate independently of a computer and they are available in various shapes and sizes. The range includes simple economical single channel fixed function loggers to more powerful programmable devices capable of handling hundreds of inputs.
Temperature, humidity, moisture and light are the ever-changing parameter because of exposition to huge array of stimuli from their environment. It can be measured via a diverse array of sensors. All of them infer temperature by sensing some change in a physical characteristic. One must be careful when measuring temperature, humidity, moisture and light to ensure that the measuring instrument is really the same temperature, humidity, moisture and light as the material that is being measured.

2. Related Work

Homgmin Wang [1] Used Microchip's PIC microcontroller and the flash memory chip, he designed a high –capacity multi-channel data acquisition module. In the design of the hardware circuit, Focus on the multi-channel data acquisition circuit for PIC16F877 MCU and SPI communication link between the microcontroller and FLASH chip. In software development, Developed A/D conversion process uses the PIC16F877 MCU on-chip A/D converter module in C language, and the entire program of temperature acquisition using the DS18B20. The results show that: Developed a data acquisition module with low cost, simple structure and high reliability features.

Anindita Bora [2] have designed the low cost Data Acquisition System (DAS) using PIC18LF4553. The designed DAS has 4 analog input channels having 12-bit resolution and was interfaced through the USB port of the PC. The interface to the PC is basically a USB based virtual serial port emulation using FT232R, a USB to serial UART interfacing IC. The PIC microcontroller firmware has been written in C language and compiled using MikroC compiler for PIC and downloaded to the microcontroller by using USBurn programmer for PIC. A PC application program has been also developed using MATLAB, which allows displaying the waveform of the signal(s) in real time and storing the data into the hard disk of the computer for future use and analysis.

Swati J Modi **[3]** described the design and development of ZigBee based Data Acquisition System (DAS) for the

measurement of physical parameters. Physical parameters such as temperature, humidity, light intensity etc., which are generally slowly varying signals are sensed by respective sensors or integrated sensors and converted into electrical signal. The DAS is designed using PIC18F458 microcontroller, communicating with Personal Computer (PC) through ZigBee. The designed DAS has been tested with the application program developed in MATLAB, which allows controlling and monitoring measuring parameters.

3. System Overview and Proposed Method

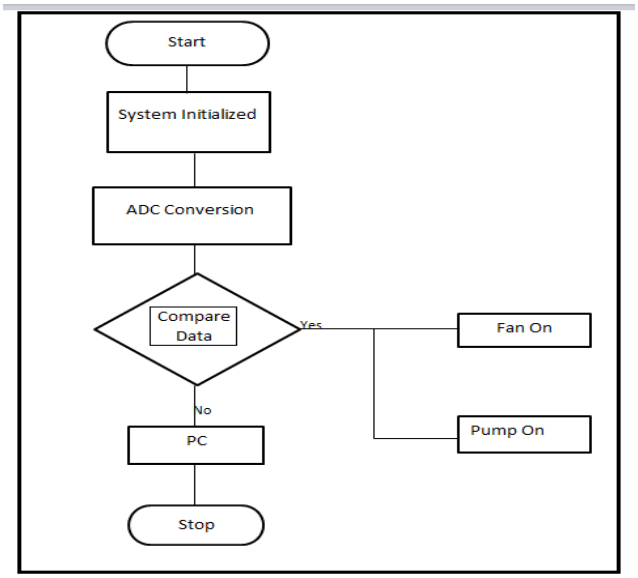

Figure 1: System Overview and Proposed Method

For the design and development of the system, the methodology used involves the software and hardware implementation. The actual implementation of the system involves the following steps:

- System Definition: Broad definition of system hardware including microcontroller and its interface with display, ADC, memory etc.
- Circuit Design: Selection of ATMEGA 8A microcontroller and other interfacing devices, as per system definition. Design of hardware circuit and its testing on laboratory kits with some simple microcontroller software routines.
- PCB Design and Fabrication: Generation of schematic diagrams and the production of circuit board layout data for the procurement of the circuit board.
- Hardware Modifications: Making any hardware changes found necessary after the initial hardware tests, to produce a revised circuit board schematic diagram and layout.
- Software Design: Developing algorithm for the system, allocating memory blocks as per functionality, coding and testing.
- Integration and Final Testing: Integrating the entire hardware and software modules and its final testing for data acquisition.

4. Description of The Proposed Method

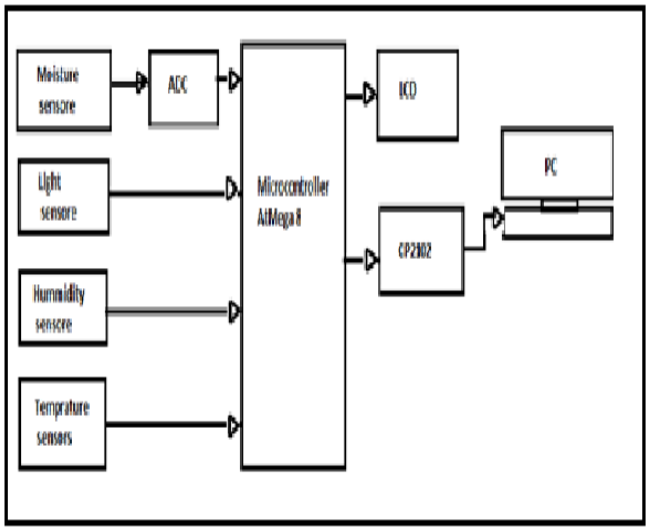

Figure 2: Description of The Proposed Method

From the block diagram of data logger and parameter controller for greenhouse the four sensors i.e., moisture, humidity, light, and temperature sense the parameters from environment in green house. The soil moisture is measured in the pH format will be in analog to digital converter.

The humidity sensor DHT11 gives the reading value in digital from directly as well as light sensor gives values directly into digital form. Hence no need to convert it into any. That voltage value gives to ATMEGA8 microcontroller. ATmega8 is 40 pin microcontroller has 4different part i.e., port A, port, port C and port D. ADC is inbuilt on port A in microcontroller ATmega8.Which LCD act as output device with microcontroller on port.

We have used Microcontroller as a main component of the project. Now a Microcontroller has become a main component of many of the electronic circuits. Also Liquid Crystal Display (LCD) and personal computer is used on major basis for the display and storage purpose.

This project which will consist of two basis modules first is “Data monitoring” & other is “Data Storage”. A display unit will show the value of parameters. This will help for the person to know the values, for this purpose we are going to use various sensors, which will be connected to ADC.

5. Results

The entire sensors are interfaced successfully with the microcontroller and successfully display result on PC. Figure below shows the result of the parameter name and value on PC.

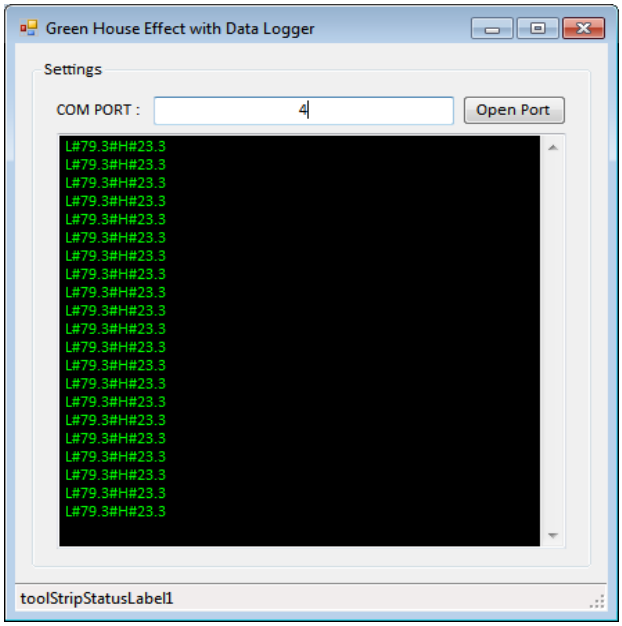

Figure 3: Result of the parameter name and value on PC

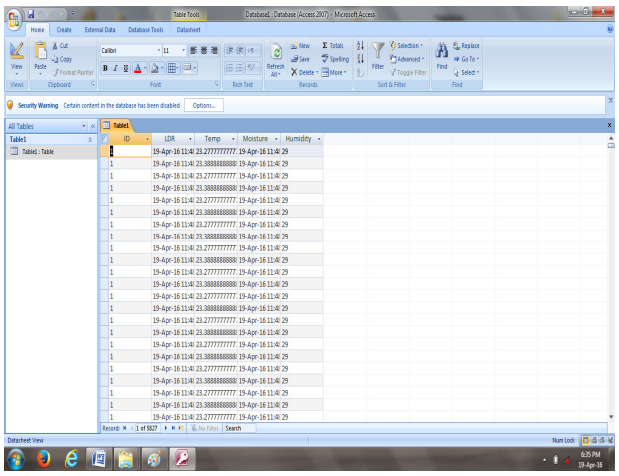

Figure 4: parameter value measured by controller

The Temperature is measured in degree Celsius; Humidity is measured in percentage RH. The Detection of carbon monoxide is indicated by HIGH or LOW indication on LCD.

The parameter value measured by controller is displayed on PC by using Terminal Software.

In Terminal software there is an option of opening COM Port, i.e. the Terminal software will shows us the data received on the respective COM port.

6. Conclusion and Future Work

The data acquisition system is use to collect and analyse experimental data, having the ability to clearly present real time results. Using sensors and probes the system able to responds the parameters which are beyond the normal range available from most traditional equipment. The system is used for measuring the temperature, humidity and detection of carbon monoxide. We have design a weather data acquisition system, which is of less cost, portable, and consumes low power. It is an efficient system, which works in real time mode and measures the parameter like temperature, humidity and detects the presence of carbon monoxide gas. These data can be seen on monitor using Terminal software.

Furthermore for future work:

- We can improve the data logger by incorporating the wireless communication in it. Therefore, by combining the term data acquisition and wireless communication, it becomes wireless data acquisition. This new innovation technology has become the trend for most industries and companies around the world to gather information due to its reliability and outstanding outcome. The advantage of this technology is that it did not use any physical components or wires to transfer the data obtained from sensor at transmitter side to the receiver side. As a result, an effective system is developed where it is not only removes all the conventional hardware and replace with a transceiver modem for data transfer but also a cost effective system as well. Moreover, the data transmission range can be extended into longer range depending on the transceiver modem capability. With this feature, information from the transducer could be transmitted faster and acts as an early alert in case of accident or disaster such as fire, food and earthquake. We can improve the graphical user

interface. By modifying the GUI we can display the waveforms of the data on the computer console whereas presently we are logging the data to the file. We also can incorporate the USB (universal serial bus) communication so that we can transfer the data at higher data rates.

- Data Loggers are changing more rapidly now than ever before. The original model of a stand-alone data logger is changing to one of a device that collects data but also has access to wireless communications for alarming of events, automatic reporting of data and remote control. Examples
- A flight data recorder (FDR), a piece of recording equipment used to collect specific aircraft performance data. The term may also be used, albeit less accurately, to describe the (CVR), another type of data recording device found onboard aircraft.

- An (EDR), a device installed by the manufacturer in some automobiles which collects and stores various data during the timeframe immediately before and after a crash. A (VDR), a data recording system designed to collect data from various sensors on board a ship.

- Ultra Wideband Data Recorder, high-speed data recording up to 2 Giga Samples per second. The growing, preparation, storage and transportation of food.

- Data logger is generally used for data storage and these are small in size. A Temperature Recorder for monitoring the performance of a heating and air conditioning system.

Adding of more sensors to monitor other environmental parameters such as Soil PH Sensor, CO2 and oxygen Sensor while allowing the replacing of current sensors if a wider range of measurements is desired. And also Integration of additional monitoring devices such as a Wi-Fi camera to monitor growth of agricultural product. And also the data can be uploaded to web server continuously.

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