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LOW COST DATA ACQUISITION SYSTEM USING ARDUINO AND C#

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Abstract: - In this system a low cost Data Acquisition system was developed. The primary objective of this work is to develop a low cost Data Acquisition system that can be used for different types of sensors. Arduino Uno microcontroller board was used for receiving sensor data. A C# windows application was developed for receiving the data from the Arduino board through the PC's COM port and logging it to a Microsoft Excel document. This Data Acquisition System can be used for a variety of applications and logging of various sensor data but for this experiment ultrasonic sensor and temperature sensor were used.

Keywords: **Arduino, Data Acquisition System, C#, LM35, HC-SR04**

1. Introduction

Data acquisition systems play a vital role in the fields of research and Engineering because they provide an indispensable interface between real-world physical phenomenon which are in analogue form and artificial computing which is in digital form. They assist scientists and researchers to easily analyse their experimental data. Due to the sophistication of commercially available Data Acquisition systems which have complicated circuitry in a bid to increase noise cancellation and rejection, they are very expensive. This work proposes a general purpose low cost Data Acquisition system that can be interfaced with various sensors and logs the data in a Microsoft Excel Document. The system is general purpose, hence all sensors that are compatible with Arduino can be used depending on the application.

2. Literature review

Tiago Francisconi Borges Camargo et al [2] designed a Data Acquisition System using Arduino and Scilab for the integration of sensors to the computer. The system was targeted for poultry coops environmental internal and external conditions (temperature and humidity) measurement.
Natanael A. V. Simoes and Gracinete B. de Souza [4] developed a low cost automated data acquisition system for urban sites temperature and humidity monitoring based in internet of things. This work produced an automated Data Acquisition system that communicates the interaction and interoperability of temperature and humidity sensors through the internet. Results proved that the use of internet of things improved the effectiveness of automatic decision making for the system.

I.O. Misiruk et al [3] developed a Data Acquisition System Based on Arduino Platform for Langmuir Probe Plasma Measurements. Arduino Nano was used to design this simple data acquisition system and Bluetooth protocol was used for data transmission. An Android application was developed for data visualization and analysis. The system was successfully implemented to acquire Langmuir probe with a hollow anode measurements data.

P.P. Machado Jr et al [5] designed a Power factor metering system using Arduino. A power factor measuring data acquisition system was developed and the results obtained were compared to some commercial measuring instruments. The programming logic was developed based on theoretical equations for calculating power factor.

Nisha Kashyap [6], Design of Low Cost Multi Channel Data Acquisition System for Meteorological Application. A low cost multi-channel Data acquisition system was designed for acquiring temperature, humidity, barometric pressure, altitude and light intensity from the environment and store the data in a PC for future use. The sensors are interfaced with ATmega328 which performs the acquisition function and data logging.

3. System Description

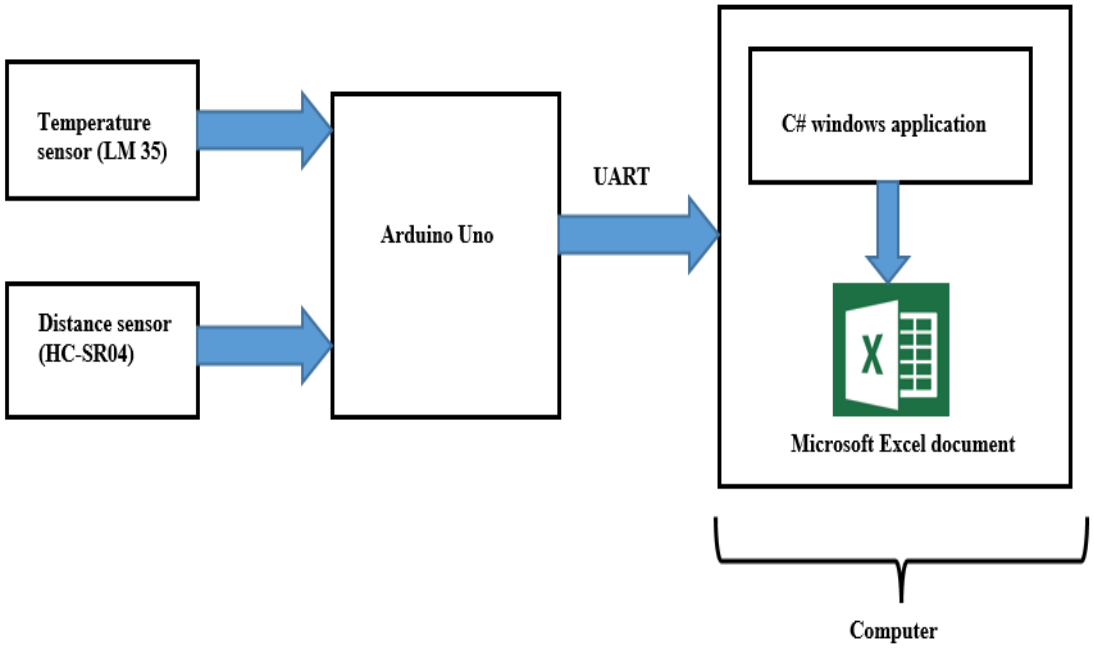

Fig 1: System block diagram

The sensor data is measured, decoded and processed by the Arduino board and then sent to the computer through the serial COM port. The data is then handled by the C# windows application which has the capability of starting to log the data, stopping logging and saving the data into a Microsoft Excel document. The windows application has a drop-down menu for selecting the COM port, so that the user can select the port where the Arduino board is connected. When the system is connected and ready the user can select the start button on the application and the application starts logging the data. The data will have a time stamp which will also be saved along with the data sampled at that time. Every second the data is sampled, but it can be changed either by increasing or decreasing the sampling time. When the user presses the stop button the system stops sampling. The data is saved by clicking the "SAVE DATA" button. The path for saving the data can be easily changed.

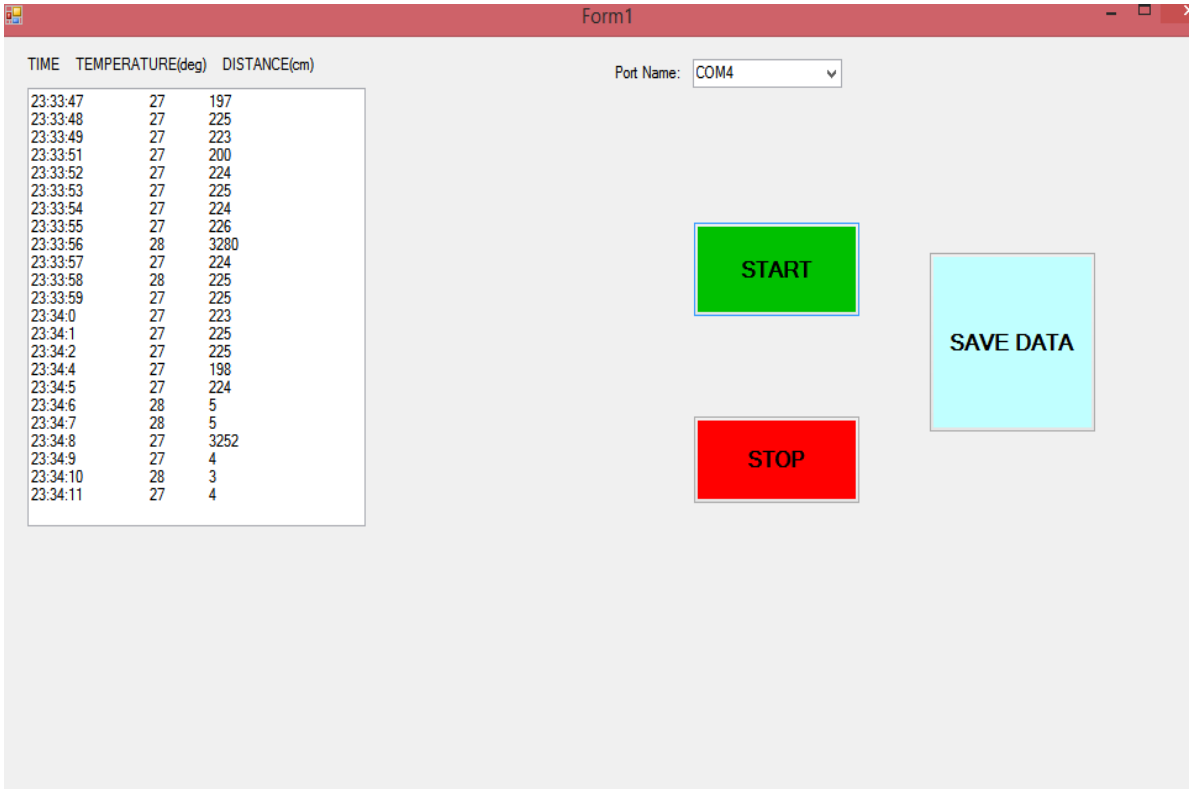

Fig 2: the windows application

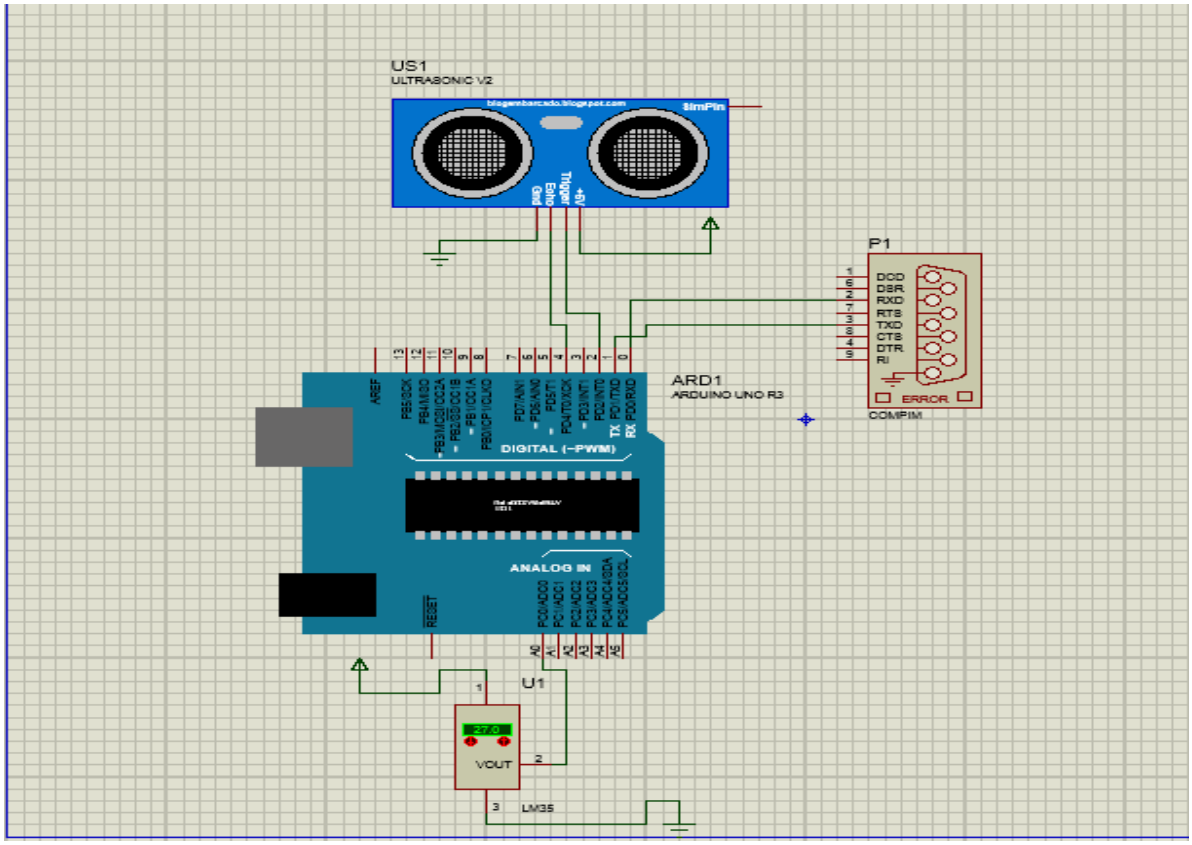

Fig 3: Hardware schematic

4. Results

	A	B	C	D	E	F
1	23:33:15		27	224		
2	23:33:16		27	224		
3	23:33:17		27	225		
4	23:33:19		27	223		
5	23:33:20		28	12		
6	23:33:21		27	11		
7	23:33:22		27	227		
8	23:33:23		27	224		
9	23:33:24		27	224		
10	23:33:25		27	200		
11	23:33:26		27	224		
12	23:33:27		27	226		
13	23:33:28		27	223		
14	23:33:29		27	198		
15	23:33:30		27	225		

Figure 4: logged data from Microsoft Excel document

In the table above tab “A” shows time, tab “C” shows room temperature measured by the temperature sensor and tab “D” shows distance measured by the ultrasonic sensor.

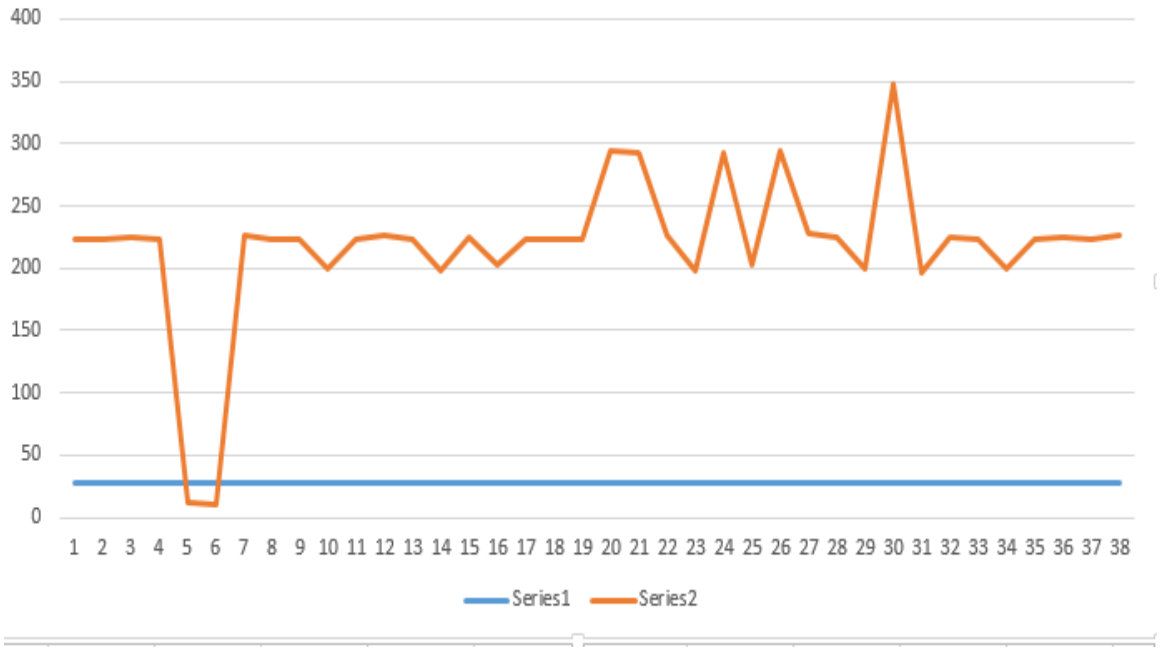

Figure 5: Data plotted from the Microsoft excel document

In the graph above, the orange series shows the distance measured by the ultrasonic sensor while the blue series shows the room temperature measured by the LM35 sensor. The temperature graph is constant because only room temperature was used for conducting the experiment, the distance graph is fluctuating because a hand was used by moving it closer to the sensor and away so that different values of the distance can be obtained. These results prove the feasibility of the system and it can be used in industry for acquiring various sorts of data.

4. Conclusion

The system was successfully implemented as proposed and results were obtained as expected. The future scope of this work is to include more sensors in the system and to make the system plot live graphs of the various parameters being measured. Another goal is to connect the system to the internet so that the sensor data can be accessed and analysed remotely.

5. REFERENCES:

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