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WI-FI Based Wireless Datalogger

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Abstract: ***This paper aim is to develop a Wi-Fi based wireless Datalogger through which we can measure any physical or environmental parameters like temperature, pressure, current, water level, soil moisture, rainfall, wind speed and direction, pulse signals etc, and store the data for a period of time. Data loggers can record a wide variety of energy and environmental measurements including temperature, relative humidity, AC/DC current and voltage, differential pressure, light intensity, water level, soil moisture, rainfall, wind speed and direction, pulse signals etc. During configuration the datalogger is physically connected to the PC and search for an existing wireless network so that it can be placed anywhere within range of the network. Our developed system measures different physical parameters and retain them for a period of time using datalogger shield which is connected to PC through wireless with the aid of Wi-Fi shield. The Wi-Fi shield used here is Tinysine Wi-Fi shield and it's based on roving networks RN-XV module. It provides the bridge between TTL serial port and IEEE802.11b wireless communication network, which helps to connect the entire setup wirelessly to the PC. This system is portable and easy to handle for recording all the physical or environmental parameters and storing it for a period of time.***

Keywords: Datalogger, Wi-Fi, RN-XV, TTL, SD, PC, TCP, VI.

1. Introduction

In earlier days there is lack of device where we can use a single system in real time to monitor and store the different physical or environmental parameters like temperature , pressure, etc. Hence we developed a system using Datalogger to monitor and store the parameters. Datalogger is an electronic device that records various data over time. The datalogger is generally portable, battery powered, internal memory for data storage and equipped with a microprocessor and sensors. Some data loggers interface with a personal computer and utilize software to activate the data logger and view and analyze the collected data. One of the primary benefits of using data loggers is the ability to automatically collect data on a continuous basis. Data loggers are typically deployed and left unattended to measure and record information for the duration of the monitoring period. This allows for a comprehensive, accurate idea of the environmental conditions being monitored, such as air temperature and relative humidity.

We developed a Wi-Fi based wireless data logger through which we measured and monitored a parameters temperature, pressure, altitude etc for a period of time. During configuration phase, the data logger will search for a wireless network while it is physically connected to the PC. Once wireless network is available then be can be placed anywhere within range of the network.

2. WI-FI based Datalogger

The data logger is connected to a PC via a USB interface. The data logger software is used to select logging parameters (sampling intervals, start time, etc.) and activate the logger. Wi-Fi system 802.11b, Arduino UNO with ATmega328 and data logger is used to developed a system. The simulated result is obtained by using NI-LabVIEW software and Arduino IDE software. The LabVIEW is the graphical programming language through which the different virtual instrumentation(VI) can be built for different sensors and the output of the sensors will be stored in the datalogger shield which has SD card within it later it is wirelessly connected to the PC by creating the TCP sessions.

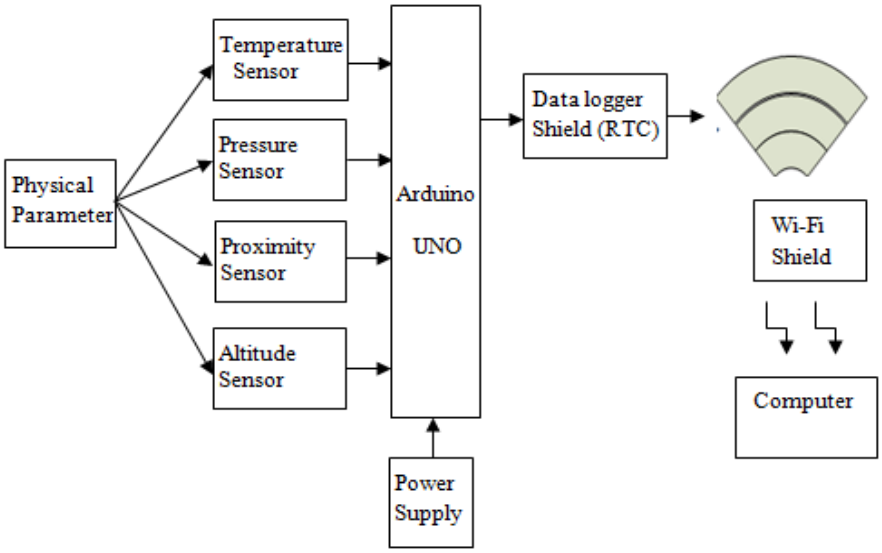

Figure 1: Proposed block diagram

The above figure-1 shows the block diagram for the whole system where different sensors like temperature, pressure, proximity and altitude are connected to the ATmega328 microcontroller. The datalogger shield is connected to ATmega328 and on top of it the tinysine Wi-Fi shield, which has been connected wirelessly to the PC which creates putty session and hence all the required parameters are read successfully.

3. Hardware Implementation

A. Adafruit datalogger

Here we are using the Adafruit datalogger [11] where this device can be used to log the different parameters. Latest version of this popular shield has all the features of the popular original, but comes pre assembled. Saving data to files on any FAT16 or FAT32 formatted SD card, to be read by any plotting, spreadsheet or analysis program. This will also show us how to use two free software programs to plot our data. This has Real Time Clock timestamps so all our data with the current time, so that we know precisely what happened when! The data logger is a reliable, well-rounded and versatile design. It is easily expanded or modified and come well supported with online documentation and libraries. The figure-2 shows the datalogger shield. Through this we can store the data with time and date stamp. SD card interface works with FAT16 or FAT32 formatted cards. 3.3v level shifter circuitry prevents damage to your SD card. Real time clock (RTC) keeps the time going even when the Arduino is unplugged.

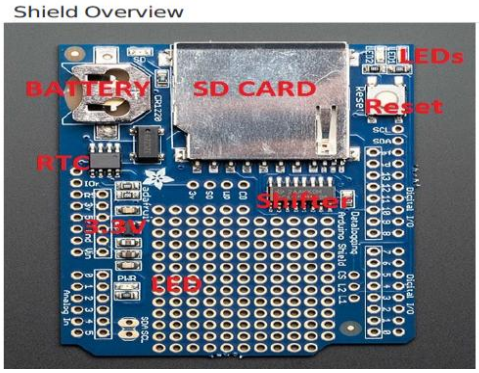

Figure 2: Datalogger shield

B. Sensors

LM35 Precision Centigrade Temperature Sensor

The LM35[11] series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. LM35 device has an advantage over linearly- proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾° Cover a full −55°C to 150°C temperature range.

BMP180 Pressure Sensor

The BMP085[13] is the fully pin and function compatible successor of the SMD500, a new generation of high precision digital pressure sensors for consumer applications. The ultra-low power, low voltage electronics of the BMP180 is optimized for use in mobile phones, PDAs, GPS navigation devices and outdoor equipment. With a low altitude noise of merely 0.25m at fast conversion time, the BMP180 offers superior performance. The I2C interface allows for easy system integration with a microcontroller. Through this the pressure values can be read easily.

Proximity sensor

Here the proximity sensor is used to detect the metals. In proximity sensor there are few types that is capacitive proximity, inductive proximity, photoelectric proximity, IR proximity type. In this system the inductive type proximity is used. Where it help to detect the metal and the capacitive type detects non metallic things like plastic, wooden materials. The inductive proximity sensor have the sensing range from 3mm to 60mm it comes with different type of inductive sensors.

C. Tinysine Wi-Fi shield

Tinysine Wi-Fi shield[12] based on Roving Networks RN-XV module. It can be separate two parts – Tinysine Bee shield and WiFiBee module. It provides the bridging from TTL serial port communication to IEEE802.11b wireless communication. So any device with TTL serial ports can easily be connected with this Wi-Fi shield and controlled and managed remotely through a wireless network. Different kinds of communication protocols and encryption algorithms are integrated with the module figure 3 represent the Wi-Fi shield.

Figure 3: Tinysine Wi-Fi shield

4. Results

A. Virtual instrumentation for Wi-Fi configurations

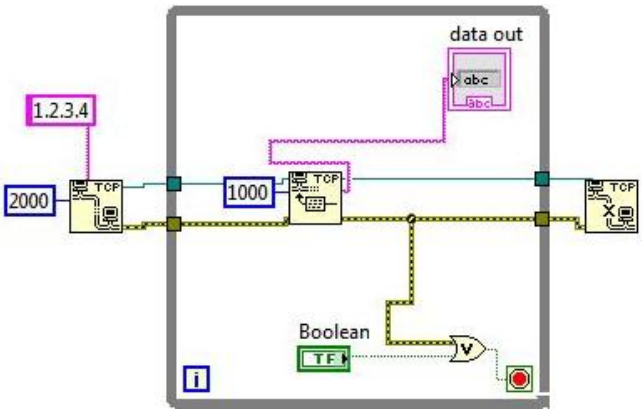

Figure 4: Wi-Fi configurations

The above figure-4 virtual instrumentation (VI) represents the Wi-Fi configuration through the TCP blocks that is TCP initialize to which the address is given as 1.2.3.4 and 2000 is service name or the remote port then the TCP read block is connected to which the output block is connected and at the last the TCP close block is connected to close the session.

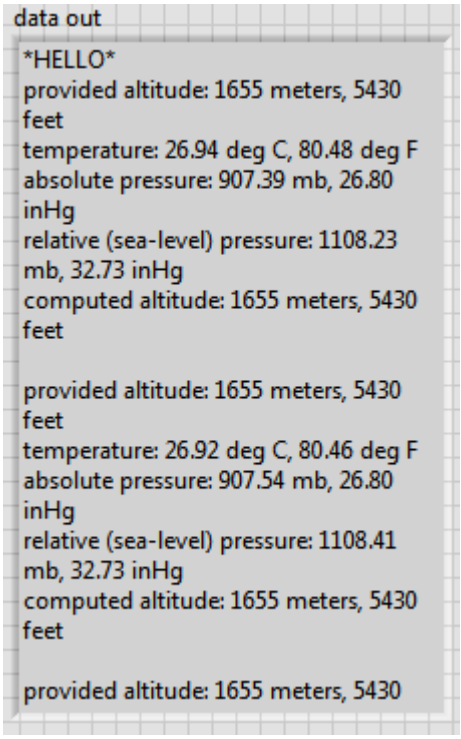

Figure 5: Front panel with output

In figure-5 shows the front panel with the desired output where different parameters are read successfully.

B. Virtual instrumentation for Digital sensor

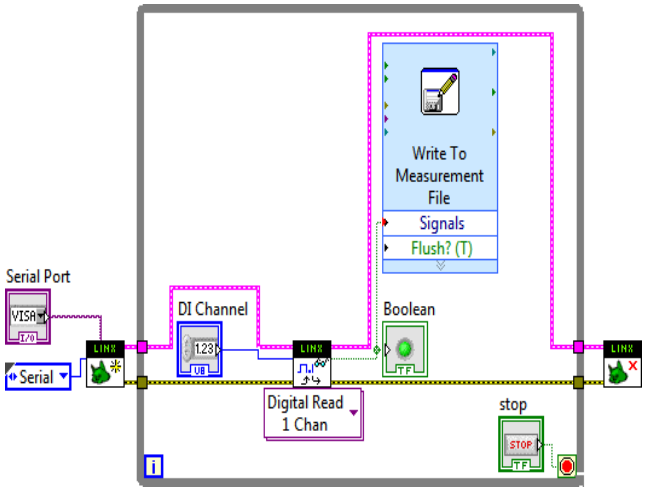

Figure 6: VI for digital sensor

In figure- 6 the VI is been created for digital sensor where it represents the different blocks like initialize block, digital read to which the digital channel select block is connected at the input side and the output block is connected at the output side in the form of write measurement file to excel sheet finally the while loop is closed by using the close block.

C. Output for Proximity sensor

Time	Untitled
6/19/2015 18:15:44.000	0
6/19/2015 18:15:48.000	0
6/19/2015 18:15:48.712	0
6/19/2015 18:15:48.996	0
6/19/2015 18:15:49.231	0
6/19/2015 18:15:49.453	0
6/19/2015 18:15:49.674	0
6/19/2015 18:15:49.889	0
6/19/2015 18:15:50.109	0
6/19/2015 18:15:50.327	1
6/19/2015 18:15:50.529	1
6/19/2015 18:15:50.748	1
6/19/2015 18:15:50.983	1
6/19/2015 18:15:51.230	1
6/19/2015 18:15:51.464	1
6/19/2015 18:15:51.692	1
6/19/2015 18:15:51.950	1
6/19/2015 18:15:52.194	0
6/19/2015 18:15:52.439	0
6/19/2015 18:15:52.683	0
6/19/2015 18:15:52.939	0
6/19/2015 18:15:53.225	0
6/19/2015 18:15:53.514	0
6/19/2015 18:15:53.743	0
6/19/2015 18:15:53.966	0
6/19/2015 18:15:54.185	0
6/19/2015 18:15:54.398	0
6/19/2015 18:15:54.622	0
6/19/2015 18:15:54.887	0
6/19/2015 18:15:55.137	0
6/19/2015 18:15:55.385	0
6/19/2015 18:15:55.605	0
6/19/2015 18:15:55.837	0
6/19/2015 18:15:56.088	0

The above table shows the output for the Proximity sensor. In case of metal detection the output will be binary 1 or else output will be binary 0 in case of no metal detection with time stamp in the excel sheet.

5. Conclusion

In this paper we present a new and precise temperature, pressure, humidity etc measurement system, by using wireless communication module, realizing wireless transmission is simpler but also low cost, high reliability, easy maintenance and less interference in transmission etc. By the help of this system we can log the different physical parameters and store the data for several days. This system is very effective where continuous monitoring of different parameters should be carried out. From this project we can even calculate the energy consumption that is by connecting the voltage and current sensor so that we can calculate the power and energy consumption. This system can even used as GPS for location finding with using altitude values.

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