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ORIGINAL ARTICLE

Microcontroller Based Humidity Display System For Greenhouse

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Abstract:

The humidity is one of the important parameter required for proper growth of plants. Some of the plant requires more or less humidity as compared to other Plants. Therefore it should get the humidity as per its requirement. In traditional techniques, plants grow in uncontrolled humidity which affects the growth of plants. It is necessary to measure the humidity of greenhouse and control the same accordingly as per the plant requirement. Therefore, microcontroller based embedded system is designed to measure and display the humidity of greenhouse and presented in this paper.

The present embedded system is designed by using 89S52 Microcontroller and to sense the humidity, SYHS220 is used. The voltage produced by SYHS220 is converted to digital form by ADC 0808. To display the humidity LCD displays is used. The firmware is developed in assembly in Pinnacle, IDE. The results regarding implementation of an embedded system are interpreted in this paper.

KEYWORDS:

Humidity sensor, ADC, Microcontroller, LCD Display.

1.INTRODUCTION

Humidity is the measure of the water vapor content or the moisture level of the atmosphere. Humidity relates the terminology such as dew, fog, condensation of water vapor, precipitation etc. The amount of Water vapor in the air depends upon various Environmental conditions. Therefore, the meteorologist can express the humidity of the air in terms of absolute humidity, relative humidity, specific humidity, mixing ratio etc. However, normally relative humidity is the metric used in forecasting weather. Humidity is also one of the responsible parameter for the growth of plants.

The present work is intrusively based on the designing and implementation of microcontroller based system to measure the humidity of greenhouse. It emphasizes the designing of hardware and dedicated software. The hardware, encompassing sensors, signal conditioners, data acquisition system and digital display, is designed and successfully implemented to develop the required system. By using the humidity sensor SYHS220, humidity measurement system is developed.

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2. THE HARDWARE:

The block diagram of an electronic circuit that is developed to measure the humidity of the environment is shown in following fig (1) which consists of a humidity sensor SYHS220, ADC0808, LCD display & microcontroller 89S52.

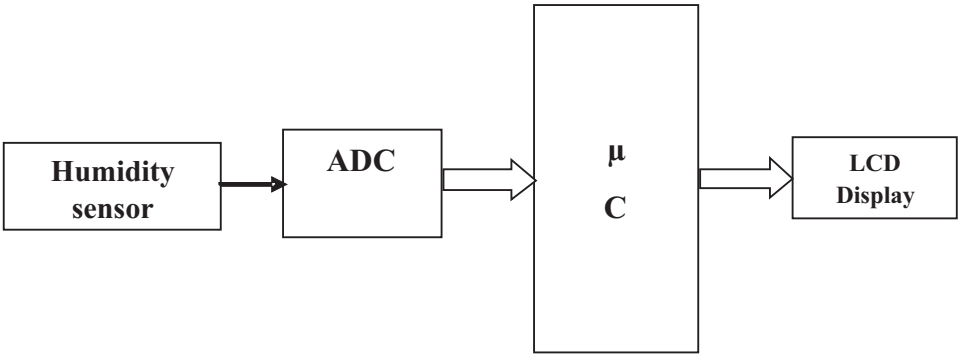

Fig (1) Block diagram

The complete schematic of the circuit designed for present system is depicted in following fig (2).

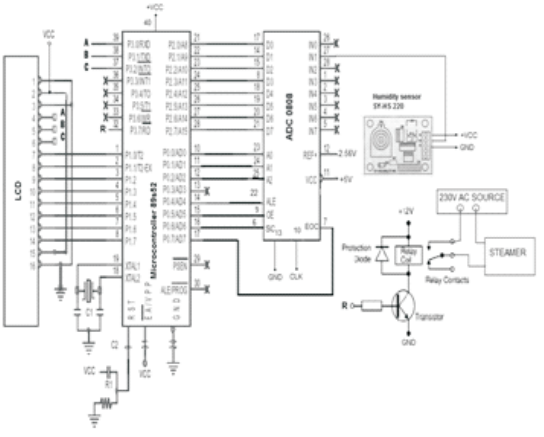

Fig (2) Schematic of the Circuit

The output of humidity sensor (SY-HS 220) is given to channel 1 of ADC-0808 and the output of ADC is given to Port P2 of Microcontroller 89S52. The LCD display is connected to port P1of the Microcontroller. The humidity of greenhouse is sensed by the humidity sensor SY-HS 220. This humidity signal is analog in nature, So that it is converted into digital form by ADC-0808. The 8-bit output of ADC-0808 is then processed by the Microcontroller, which converts this hexadecimal data to ASCII format & then sends it to LCD display.

2(a) Humidity Sensor (SYHS220):

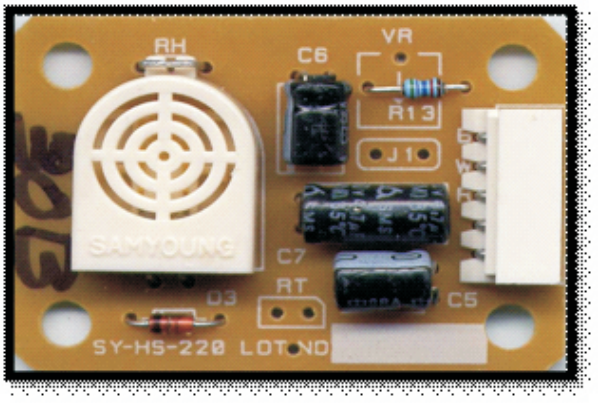

Fig (3) Humidity Sensor SYHS220

The humidity sensor SYHS220 is highly precise and reliable. Following table (1) illustrates the characteristics of the sensor. It is a smart sensor, which provides DC voltage depending upon humidity of the surrounding in RH%. This work with +5 Volt power supply and the typical current consumption is less than 3 mA. The operating humidity range is 30% RH to 90% RH. The standard DC output voltage provided at 25^0C is 1980 mV. The accuracy is ± 5% RH at 25^0C.

The sensor provides three pins recognized as B, W and R. The pin labelled W provides the DC output voltage, where as the pin labelled B is ground. The VCC of +5V is applied at the pin R. This board is mounted in such a way that it can probe in to desired environment.

Sr. No.	Parameters	Typical Values
1.	Current consumption	< 3.0 mA
2.	Power supply	+ 5Volt
3.	Operating temperature	0 to 60 ^{0}C
4.	Standard output	DC 1.980V (at 250C and 60 % RH)
5.	Humidity range	30 to 90 %RH
6.	Accuracy	5% RH
7.	Storable Humidity range	Within 95%RH

Table (1): Characteristics of humidity sensor SY-HS-220

2(b) AT89S52 Microcontroller:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8Kbytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

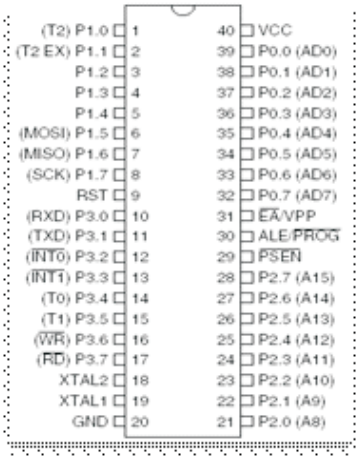

Fig (4) Pin out of AT89S52

2(c) ADC 0808:

The ADC0808 is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microcontroller compatible control logic. The 8-bit A/D converter uses successive approximation as the conversion technique. The 8-channel multiplexer can directly access any of 8-single-ended analog signals. The device eliminates the need for external zero and full-scale adjustments. Easy interfacing to microcontroller is provided by the latched and decoded multiplexer address inputs and latched TTL TRI-STATE outputs. The ADC-0808 have high speed, high accuracy, minimal humidity dependence, excellent long-term accuracy and repeatability. It consumes minimal power.

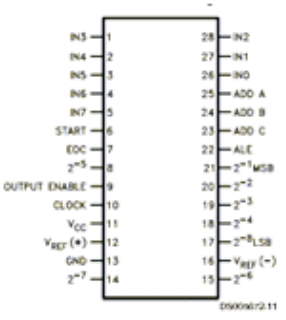

Fig (5) Pin out of ADC 0808

2(d) LCD (Liquid Crystal Display):

The LCD used in this microcontroller based embedded system to display the humidity values consist of 8 pins for data lines D0-D7, 3 pin for control the LCD viz. RS, R/W & E and 3 pins for power supply, as shown in figure 5.4. The figure shows the arrangement used for contrast adjustment through the potentiometer, R_{41} of 10 KΩ, connected between V_{CC} & Ground and wiper is connected to pin V_{EE}. The potential at the pin V_{EE} must be properly controlled to achieve the better contrast in the display screen. This smart LCD requires the ASCII codes of character to be displayed. To display characters, it is essential to send the commands for initialization of modes of the LCD.

The pin description of LCD display is given in the following table (2) with pin numbers.

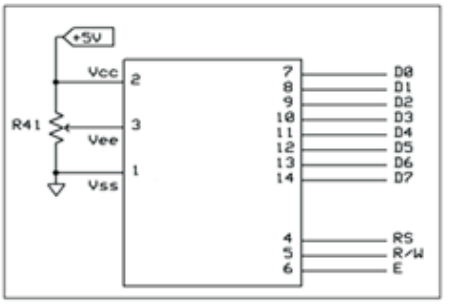

Fig (6) Pin out of ADC 0808

Pin	Symbol	I/O	Description
1	V_{SS}	---	Ground
2	V_{CC}	---	+5V power supply
3	V_{EE}	---	Power supply to control contrast
4	RS	I	RS = 0 to select command register RS = 1 to select data register
5	R/W	I	R/W=0 for write ,R/W= 1 for read
6	E	I/O	Enable
7	DB0	I/O	The 8-bit data bus
8	DB1	I/O	The 8-bit data bus
9	DB2	I/O	The 8-bit data bus
10	DB3	I/O	The 8-bit data bus
11	DB4	I/O	The 8-bit data bus
12	DB5	I/O	The 8-bit data bus
13	DB6	I/O	The 8-bit data bus
14	DB7	I/O	The 8-bit data bus

Table (2): Pin description of LCD

3. THE SOFTWARE:

To run the above system an assembly language program is developed by using Pinnacle. The humidity of greenhouse is measured and displayed on the LCD display. Following are the programming steps for the system.

I) Reading of the humidity through channel No 1 of ADC
ii) Conversion from analog to digital value of humidity.
iii) Display the value of humidity on LCD Display.
iv) Repeat the process continuously

4. RESULT AND DISCUSSION:

In recent years, tremendous advancement is taking place in the field of instrumentation. An embedded system can be designed for dedicated applications. Considering this fact into account microcontroller based embedded system is developed to measure and display the humidity of greenhouse. The hardware & software for the system is designed and tested successfully in the laboratory.

5. CONCLUSION

The paper presents an electronic model based on microcontroller AT89S52 to measure and display the humidity of greenhouse. The circuit works very efficiently i.e. the humidity shown by the developed system is very closer to the standard humidity meter. It is also conclude that same type of model can be developed for the various parameters only by changing the sensors.

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