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Measurement of Humidity and Temperature using PSoC Chip for Controlled Storage.

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ABSTRACT

An embedded system is the dedicated system designed for certain specific functions. This system is embedded as a part of complete device system that includes hardware such as mechanical and electrical components. Embedded systems seek various applications in consumer electronics, automotive electronics, industrial electronics, medical electronics, safety and storage control. A Single Chip Embedded System is developed using PSoC microcontroller for storage and safety of fresh fruits and vegetables. PSoC Chip is configured and programmed to display the temperature and humidity according to the physical conditions. Change in the measured humidity and temperature will be processed using controls manually by the user with the help of actuators.

Keywords: Embedded Systems, PSoC 3 Chip, Storage

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INTRODUCTION

Embedded system is a computer that has been designed to unravel solely some terribly specific issues and is not simply modified. In distinction, a general computer will do many alternative jobs, and may be modified at any time with new programs for brand spanking new job. An embedded system sometimes doesn't appear as a personal computer , typically there's no keyboard or monitor or mouse. However like every computer it has a processor and software package, input and output. The word embedded suggests that it is designed into the system. It isactually a permanent half of an exceedingly larger system.

Embedded systems are used in many different numerous applications and span all aspects of contemporary life. Embedded systems play vital role Consumer Electronics, Remote Automation, Military/Aerospace, Automotive Electronics, Storage and safety critics. Improper storage of the different vegetables and fruits decorate their flavour and nutritionist value. These fruits and vegetables should be stored properly to maintain their integrity .Proper storage ensures that they are saved for much lifetime and can be used by customers all over the world. Fruits and vegetables lose their nutrition profile and get destroyed very easily because of the improper storage. The maintenance of post harvest quality of fruits and vegetables is getting mandatory. In different shops good quality of various fruits and vegetables always exceeds the demands. The focus on the quality of the product the consumer expectation in the supply of fresh fruits and vegetables is always high and taken for granted. This consumer expectation is often not satisfied because of long distance transport system. With the increase in globalisation, the long distance transport system of fruits and vegetables is being criticized.

The controlled storage of these products i.e. the fresh fruits and vegetables can be emerged as a new technology and can be used as contribution in fulfilling different requirements of the consumer. The controlled storage can increase the marketable life of these products. The proper storage and preservation of the specific variety of fresh fruits and vegetables can be very useful for the buyers. As the need of controlled storage is increasingly rapidly.

The Controlled Storage can be implemented with help of a PSoC microcontroller .The PSoC microcontroller is major part of Embedded System. The reconfigurable blocks present in the microcontroller provides the facility of varying the layout according to different fruits and vegetables for maintenance and storage. PSoC microcontroller along with two sensors gives complete setup for storing the fruits and vegetables. This Controlled Storage increases the time period of these fruits and vegetables which can be used for long time and numerous customers without losing nutrition profile.

This paper is described as follows: Section II gives the literature review on the existing systems. Proposed methodology is sketched in Section III. Hardware and software is discussed in Section IV and V. Implementation is projected in Section VI. Section VII concludes the proposed methodology .

LITERATURE REVIEW

Different papers have different architecture and systems which has been described. The study of existing technology is described as follows:

Nayse et.al stated the Application of wireless sensor Networks for the greenhouse parameter control in the precision agriculture, which describes that in these last decades many advancements have been implemented in the field of agriculture. Because of the uneven natural distribution of the rain water which leads to no irrigation or improper irrigation. Green house control has been proposed as best alternative solution to this problem. Cypress developed hardware PSoC and software along with radio transmission as a part of Wireless Sensor network is used to control different parameters for various crops[1].

Awasthi et.al proposed Monitoring of the precision agriculture using the wireless sensor network-a review. This paper proposes monitoring as well as the automation of real time data in agriculture using Wireless sensor network. This shows the capability of wireless network in the field of agriculture. The data is transmitted and displayed at base station using Zigbee. The parameters like soil temperature, humidity and

the moisture are kept in record continuously if they exceeds the desired limit, a text message is sent to mobile through GSM network.The hardware and software implementation including the wireless node[2].

Patil et.al proposed the PSoC microcontroller based electricity generation system. The system represents efficient extraction of the maximum output power from the solar panel. Here PSoC microcontroller that is based on the photovoltaic system is introduced. Solar energy fluctuates according to the climatic conditions ,impedance of PV system is adjusted to match the change in the lighting condition. PSoC microcontroller being used as programmable Maximum Power Point Tracking (MPPT) controller[3].

Astt. Prof.Mayank Gupta et.al implemented the design of PSoC based Cap Sense for the Medical Touch system saliva Vs Blood Glucose Meter . This paper presents a new way testing the amount of glucose in blood for the patients. Saliva of the patient is collected in a patch, which on reaction with the saliva molecules gets converted into electronic signals .These electronic signals are relayed wirelessly to the hand held device. In this whole system PSoC chip is used as it is easily reconfigurable and simplifies the system[4].

Shubhasini Sugumaran et.al proposed PSoC based speech recognition system .Speech mainly is used for the purpose of communication which simply means transfer of message. Speech can be acoustic wave which is the fundamental form . Speech to be given as input needs a microcontroller .The microcontroller used is PSoC 5 with ARM Cortex-M3 as its cpu. The signal is sent to PSoC 5 and speech is recognized and the desired actions are being performed[5].

Deshmukh et.al proposed using PSoC chip . This paper describes the technique for generation of electricity using PSoC Chip . The input which in analog form is given through a to prepare a model for the generation of electricity using solar energy with help of PSoC 3[6].

Manju Mohan et.al stated The Wide Range Voltage to Frequency Converter using the PSoC3 Microcontroller , where voltage to frequency converter is configured in a single embedded PSoC 3 chip.The sensor measurement and the output is digitized. Output is transmitted to serial port through UART. Serial data from the PSoC chip is acquired by the labview and the measured data is displayed on the computer screen.[7]

Mrunali Lambat et.al proposed the Health Monitoring System using PSoC Chip where health monitoring system are of different types in different hospitals. The health monitoring system is designed using PSoC 3 chip as body temperature measurement device. Temperature sensor measures the temperature for the system. Complete system is programmed under low consumption and low cost.[8]

Moyeed Abrar et.al proposed Multipoint Temperature Data Logger and Display on Personal Computer through Zigbee using PSoC , where multipoint temperature is being monitored by embedded PSoC and Zigbee microcontroller with the help of data logger and the output is displayed on the computer screen. Wireless Sensor network facilitates ease in use and is advanced .The wired cannot be used everywhere whereas wireless provides the reliability of using it anywhere.[9]

PROPOSED METHODOLOGY

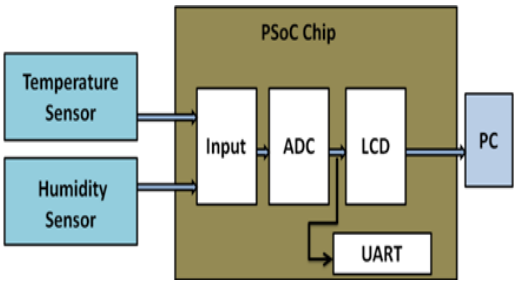

Figure 1: Basic Block Diagram

The proposed architecture of this system comprises PSoC 3 Chip, humidity sensor, temperature sensor and a pc. This system contains temperature sensor (LM35) and humidity sensor (MHTR1E). The PSoC 3

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chip CY8C38066 requires hardware and software implementation. The process block diagram is depicted in Figure 1

Controlled Storage Flowchart

For humidity check

The input given to the process H1 is SET humidity by the standards and H2 is measured humidity. The system will check whether the set humidity and measured humidity are equal or not. When set and measured values are equal the LED will glow. The process will continue normally. When Set value is greater than measured value then by manual controller with help of actuator water will be sprinkled. If measured value is greater than set value then hot air is blown.

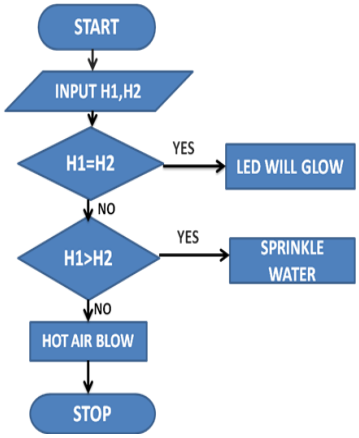

Figure 2: Humidity checking flow chart

For temperature check

The input given to the process T1 is SET temperature by the standards and T2 is measured Temperature. The system will check whether the set temperature and measured temperature are equal or not. When set and measured values are equal the LED will glow. The process will continue normally. When Set value is greater than measured value heater will e switched on manualy. If measured value is greater than set value then cooler is switched on.

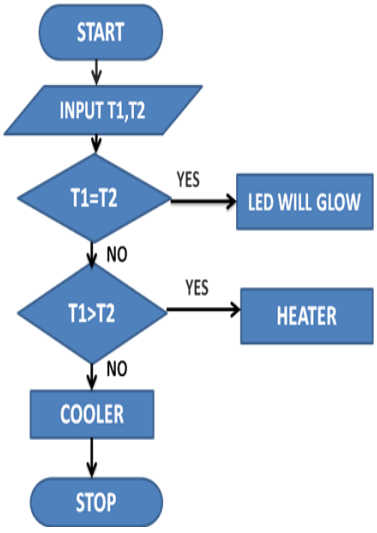

Figure 3: Temperature checking flow chart

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HARDWARE REQUIREMENTS

LM35 Temperature sensor

The temperature sensor gives output in voltage which is directly calibrated in degree Celsius (◦c).

Special Features of LM35 that are scaling factor for the sensor is 0.01V/˚C. The output is measured in the voltage which is directly proportional to the temperature measured in Celsius. The sensitivity of this sensor is 10mV /˚C. There is no need of trimming or external calibration. It maintains accuracy of +/- 0.4˚C at room temperature and +/-0.8˚C over a range of 0 to 100˚C.Supply voltage is also low from min 4V to max 30V.

MHTR1E Humidity sensor

The humidity sensor gives the output in voltage which is directly proportional to %RH.

Special Features of MHTR1E are that the accuracy of the sensor is ±5%RH.The measuring range of the humidity sensor 20 ~ 95%RH.It also has temperature testing feature. The sensor comprises humidity and temperature storage facility .This sensor is easy to handle.

PSoC 3 development kit

PSoC 3 kit provides the facility of evaluation, debugging and the prototype of the complete design. Special Features of PSoC 3 kit is flash program memory, up to 64 KB, one lakh write cycles, twenty years retention, and multiple security features. Wide operating voltage range: 0.5 V to 5.5 V. Configurable GPIO pin state at power-on reset (POR).Sixteen to twenty four programmable PLD based universal digital blocks (UDB).

SOFTWARE REQUIREMENTS

PSoC Creator

The software required to implement the program code is the creator. PSoC creator 3.0 has been used for this system. The software is interfaced by the port and the UART.

Schematic window

The components required are dragged and dropped.

Configuration of each component should be changed according to the requirement of the program. The window is shown in Figure 4.

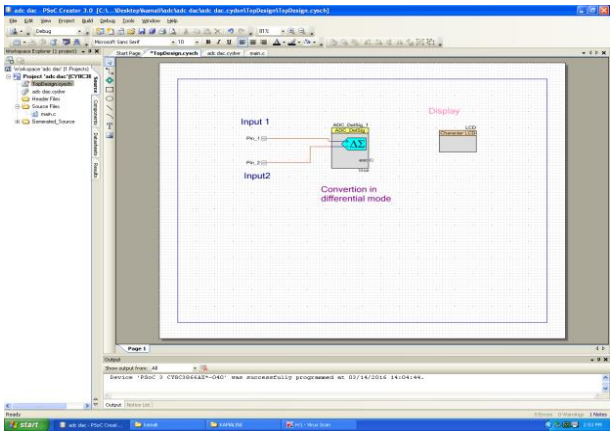

Figure 4: Schematic window

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Main C program window

This window in Figure 5.is the main window used for the coding .The entire code is developed checked for errors. The error free has to be build and then it will run.

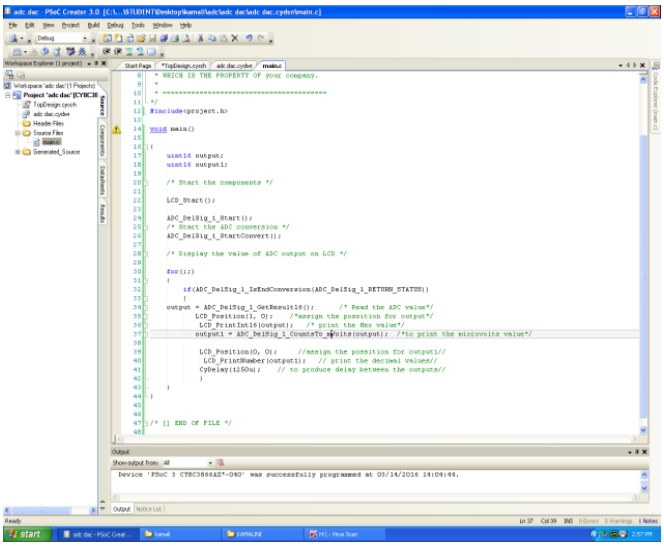

Figure 5: Main C window

Ports and pin Window

External source or any external connection to the PSoC chip has to be connected through the port and pin assignment. The pin number and Port details is assigned to external device and connected.

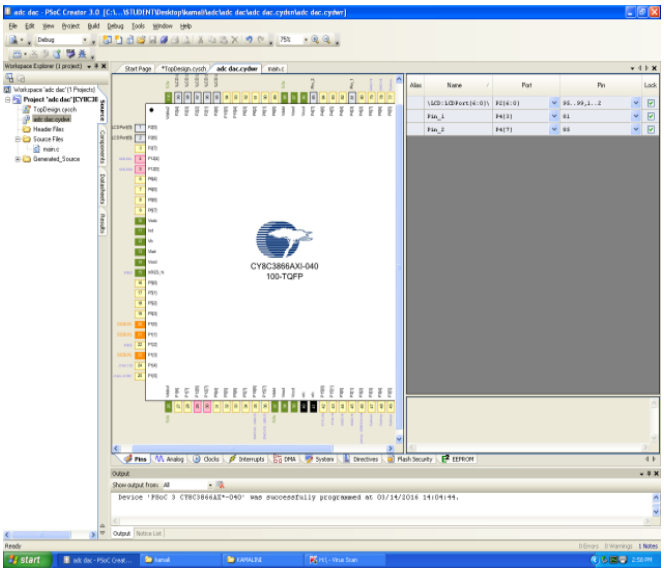

Figure 6: Port/pin window

Labview

Labview is a graphical programming methodology that can be used to quickly create applications with a professional user interface. It is widely used by engineers, student and scientist to develop test, measurement and control applications. Lab view programs are also called as the virtual instruments as they are intended to look and feel like physical measurement instruments. Every VI has mainly three core elements .Those three core elements are block diagram window, front panel window and connector pane.

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Implementation

The range for the three different groups is set. The Table 1. Displays the three different groups along with their humidity and temperature range .The PSoC 3 kit will measure the humidity and temperature at the present location. The difference in the set and measured values will be taken care manually.

Groups	Humidity	Temperature
FRT 1	90%RH	32˚F
VG 1	90%RH	50˚F
VG 2	70%RH	32˚F

Table 1: Groups of the fruits and vegetables

The fig. 7 represents the labview simulated window of the existing system. When the set and measured humidity and temperature will be equal LED will glow.

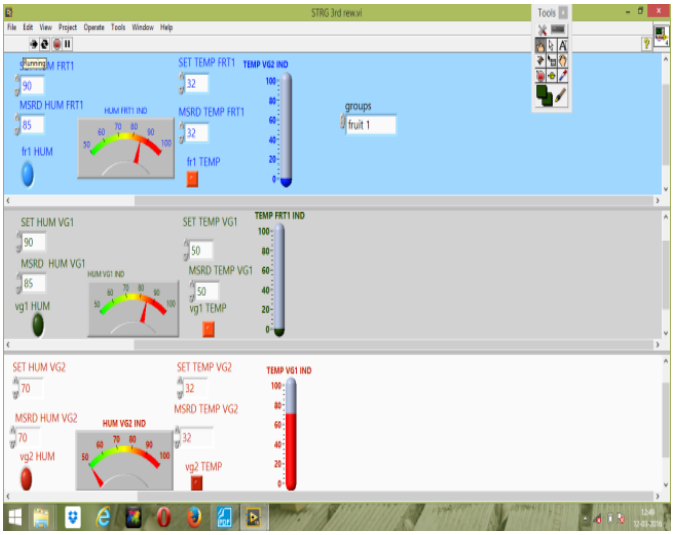

Figure 7: Labview simulation Front panel

When the set and the measured values are not equal then the required process to reduce and increase the value can be done manually. The figure 8 shows the process.

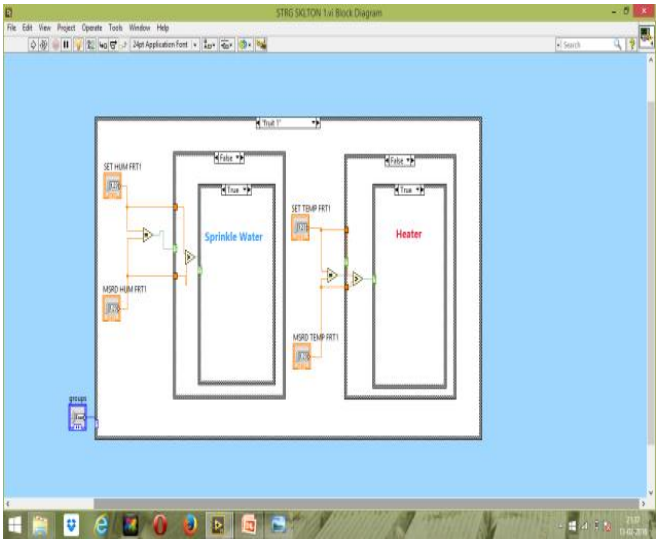

Figure 8: Labview simulation block diagram

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CONCLUSION AND FUTURE SCOPE

A new methodology is presented to approach various sensors fusion using advanced microcontroller PSoC 3. It provides the multisensor implementation, has an advantage of dynamic configuration which measures the varying temperature and humidity. One of new technique for the storage of fruits and vegetables with the help of the measured value. The maintance of the set temperature and humidity ensures the long life of the post- harvest product.

An automated system with the controller and actuators is to be developed based on the results of this work. Transducer electronic Data Sheet (TEDS) for humidity sensor will be designed using IEEE1451.0 Standard[11]. Low cost relay circuit has to developed for the complete storage setup.

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