



Design and Implementation of Smart Patient Environment Control System

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Abstract— The medical care field is a very complicated one, because it associates with people as how far they suffer from different types of diseases, where often, an inadequate or uncomfortable environment which leads to an inconvenience results. This work will provide the technology that to make the patient environment more suitable, more comfortable, and consequential to satisfy the most patient requirements, adaptability. This system is designed to control and/or surveillance the environmental parameters of the surrounding areas of the patients, particularly, such as the condition of weather and noises. The parameters of humidity and temperature are highly considered and entered via keypad and meanwhile, are being compared with the real time that measures through (DHT11) sensor and sound sensor for the proper adaptation. Also, this system controls the number of visitors inside patient's room so as to reduce the quantity of disturbances causing by them.

Keywords— Patient Environment System, Sensors, GSM, alarm system.

I. INTRODUCTION

According to the World Health Organization (WHO) the definition of nursing is a knowledge, and art that looks after human as a whole (body-mind-soul) to assisting, protecting, observing and caring the needy person with handful recovering, instantly, when he/or she is ill, so by taking the care of all the environment around him, such as: the room's temperature and the ventilation to keep him healthy, concurrently. Where the nursing's role should not be during the patient when he is in bed at hospital only, but it must gone beyond this, and it should be permanent to encourage the patient to feel comfortable and confidence.

Nevertheless, all the previous studies in the field of microcontroller are concerned with monitoring biological parameters such as blood pressure, body temperature and electrocardiogram (ECG). But these are lacked of the ability to monitoring the environment around the patient such as the visitors' crowdedness and to call in, in the state of emergency conditions. There is a highly need for environment monitoring development system through the real time monitoring patient's room, to link with GSM service for emergency SMS sending.

This Smart Patient Environment Control System (SPECS) is designed purposely, to control the room environment which including temperature and humidity according to patient requirements, using sensors. It also, provides the required security for visitors' crowdedness and avoiding disturbances.

II. APPROACH

The basic components of the system are shown in the block diagram of figure (1). It includes all the required hardware and with links interfaced them. The system accepts input data through keypad and where the parameters are compared with the real time ones, via software program.

The essential environment control equipments (air conational, sucking fan and moisture) are controlled as a result of comparison between required and real time parameters. And thus, its program is written in BASCOM language.

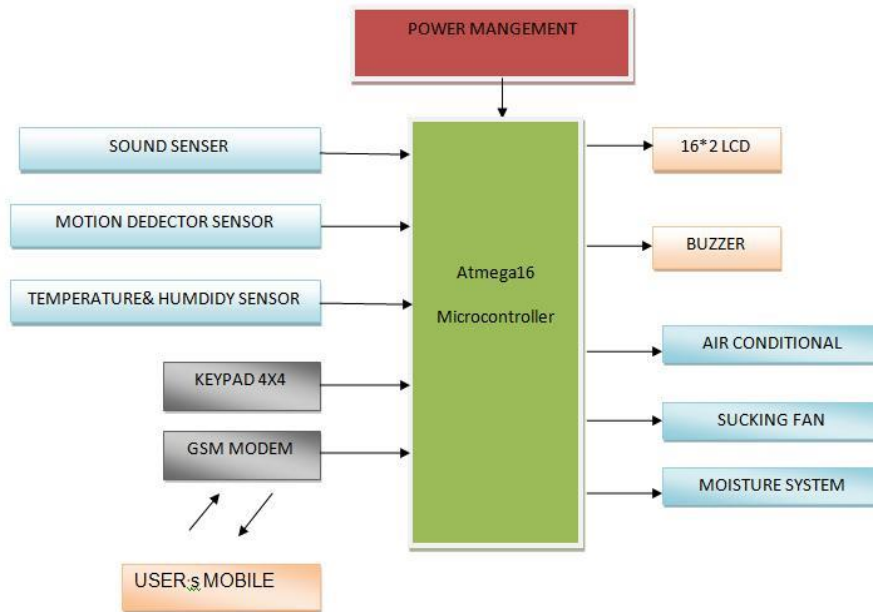


Fig1: Block diagram of the system

III.COMONENT INTEGRATED

A. Atmega16:

It has also 40 pins package consists of four group of port (A to D) as shown below in Fig.2 It also consists of analogy to digital convertor (ADC).

Although microcontroller has internal frequency generator reach to 16MHz it allows to connect external crystal clock in some applications. Atmega16 needs operating voltage between 4.5v to 5v. It also has RESET pin to restart the MCU.

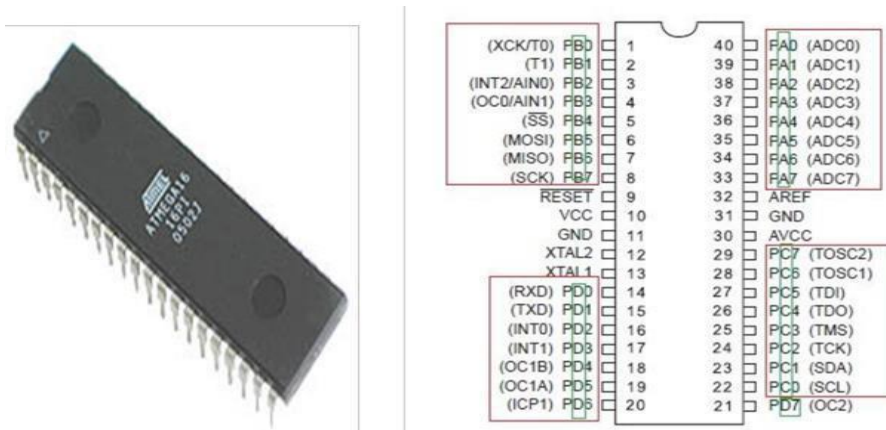


Fig 2: atmega16 Microcontroller

B. Ultrasonic Sensor:

A device which used to measure the distance from the object by using echo reflection technique which used for secure the patient room from foreigners.



Figure 3: ultrasonic sensor

C. DHT11 (Temperature and humidity sensor):

To measure Patient's room temperature and humidity, we use DHT11 sensor which is connected to the microcontroller. MCU sends a start signal to DHT11 to change it from low-power-consumption mode to the running-mode then it sends a response signal of 40-bit data that include the relative humidity and temperature information.

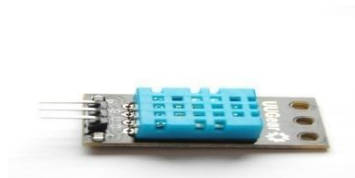


Fig 4: DHT11 sensor

D. GSM module:

A GSM module is a chip that used to establish communication between a mobile device and microcontroller through AT command. It works on frequencies 850MHz, 900MHz, 1800MHz and 1900MHz. It is very compact in size and designed with 5v.

SIMCom SIM900A module used for sending message from the system to the operator cell phone which connected via a specific number.



Fig 5: GSM sim900a

E. Fan (Air conditional):

Consisting of fins and a rotary motor used in the cases of cooling and have a velocity of velocities of different (12 and 24) volt, unlike the fins in the case of the use of a decapitation task to suction air to the inside or outside as in Figure blow.

F. ULN2003

Is a high voltage and high current Darlington array IC. It contains seven open collectors. Each channel or darlington pair in ULN2003 is rated at 500mA and can withstand peak current of 600mA. The inputs and

outputs are provided opposite to each other in the pin layout. Each driver also contains a suppression diode to dissipate Darlington pairs with common emitters. A Darlington pair is an arrangement of two bipolar transistors.

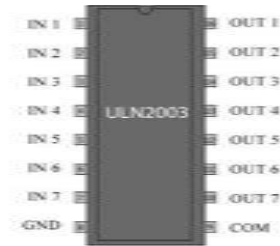


Figure 6: ULN 2003

G. Buzzer:

Buzzer or beeper is an audio signalling device it uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. Which make alarm systems when someone enter wrong password to the system.



Fig 7: Buzzer

H. Keypad (4x4):

It has four rows and four columns which used for data entering on the system control panel.



Fig 8: Keypad (4x4)

*I. LCD 16*2:*

Liquid Crystal Display screen is an electronic display module and find a wide range of applications. In this project it can be used LCD 16*2 which has 16 characters in each row and it has two rows to display temperature /humidity and movement data instead of using the serial monitor.

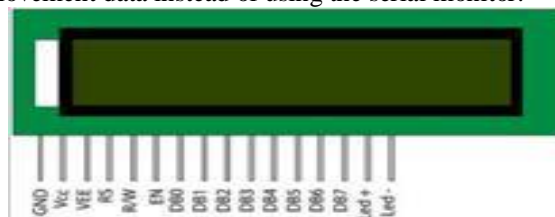


Fig 9: LCD 16*2

IV. SOFTWARE IMPLEMENTATION

The system software design is written for the main controller (atmega16) which is connected to the sensors, air conditional, sucking fan, keyboard, LCD and GSM using BASCOM language.

BASCOM is an Integrated Development Environment (IDE).It has a powerful software environment as well as comprehensive basic libraries which allow you to write and edit programs, compile and test them with a simulator. Finally the program loaded to the microcontroller by using special programmer.

V. ALGORITHM

Start:

Put the system in initial state.

Clear all controlled device.

Check for real time parameters:

- If condition met, continue processing.
- If condition not met, delay access re compare.

Analyse:

- If real time temperature is equal to the entered temperature reset air condition.
- If real time humidity is equal to the entered humidity reset spry system.
- If high noise send SMS to nurse.
- If high number of visitors then:

1. Send SMS to nurse.
2. Lock the door.
3. Activate electronic lock.

VI.DESIGN

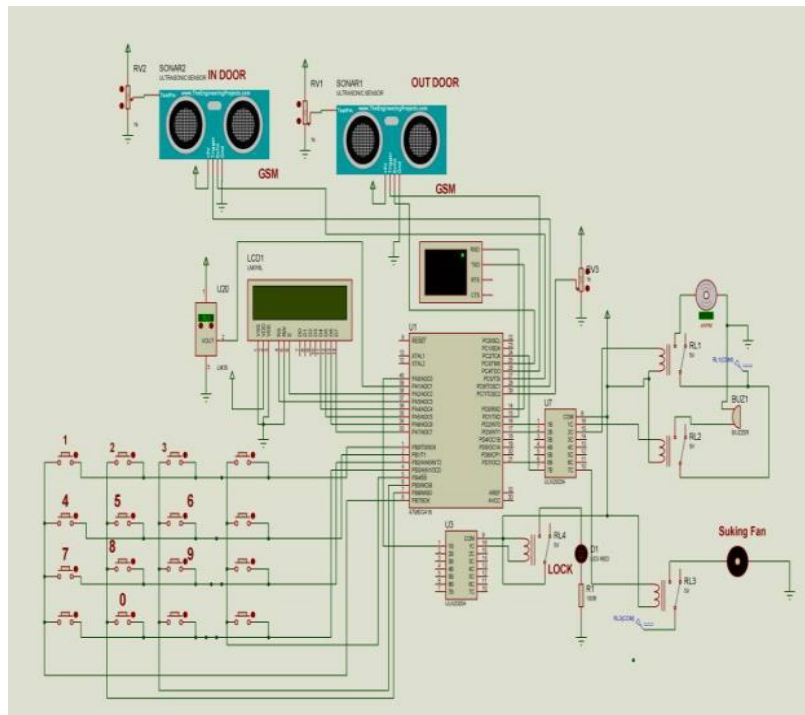


Fig 10: Protus Simulation

VII. RESULT

Table no 1: Following the results obtained from the Implemented system:

Parameters	Status	System Action
Temperature	High	Air Condition ON
	Low	Air Condition OFF
Temperature	High	Sucking Fan ON
	Low	Sucking Fan OFF
Noise	High	Send SMS& Buzzer alarm
	Low	No Action
Number of Visitors	Required	Send SMS &Buzzer alarm
		Lock the door
		Activate an electronic alarm
	Less than required	No Action

VIII. CONCLUSION

The system accepts the input parameters via keyboard and compares these parameters to real time ones, and then send SMS to nurse with activating buzzer. The SPECS is more secure and more prosperous system. It has a capability of handling a good job which might be demanded by the medications’ sickbed person.

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