

IMPLEMENTATION OF AUTOMATED CONTINUOUS POSITIVE AIR PRESSURE FOR OBSTRUCTIVE SLEEP APNOEA SYNDROME

¹K.GOWTHAM RAJ , S.INDHUMATHI, JINU CHERIAN, G.LAVANYA,²Ms.M.NISHA ANGELINE

¹UG Students, Velalar college of Engineering and Technology, Erode – 12

²Assistant Professor(Sl.Gr), Velalar college of Engineering and Technology, Erode – 12

*Email_id:*¹glalulavanya275@gmail.com,jinucherian.21@gmail.com,
indhusuresh911@gmail.com,kggowthamraj@gmail.com²nishavlsidesign@gmail.com

ABSTRACT:Obstructive Sleep Apnoea Syndrome (OSAS) is one of the most common breathing problem faced by many patients. This syndrome ruins their peaceful sleep during night time. Due to this they suffer from various troubles like daytime sleepiness, restlessness, headache, poor memory etc. CPAP invented to supply oxygen continuously during night time to the patient who is suffering from Obstructive Sleep Apnoea Syndrome (OSAS). But CPAP users feel that continuously forced air dries out the nose and mouth. To give a solution to this problem, a system with artificial intelligence is designed. In our automated CPAP, oxygen is supplied to the patient only when it is necessary based on body temperature and blood pressure. The proposed system is made up of arduino. The device consists of pressure sensor, Temperature sensor, Relay, GSM, LCD. When the pressure sensor value is less than 90 and temperature sensor value greater than 99 the arduino unit get activated automatically .It triggers the relay .The relay opens the solenoidal valve and it passes oxygen from the oxygen tank to the patient. And the buzzer will alert the other person nearby person. GSM is used to send alert message to doctor

1 INTRODUCTION

Embedded system is simply the brain of the most of the electronics based system to access, process, store and control the data. Few simple electronics circuit be intelligently hardware design without a microprocessor or microcontroller but is not worth the economics except for simple passive operation. So it is more or less must to put this so called silicon brain, which we engineers called as microcontrollers in all electronic system.

In pc desktop's mother board is an embedded system which has microprocessor memory I/O interface peripheral communication interface. This pc system architecture is designed for application such as net surfing, excel, word, power point, etc. This field of designing application specific computer systems is called embedded system development. To define in a sentence embedded system is a special purpose computer system/board which encapsulates all the devices such as processor, memory, interface and control in a single package or board to perform only a specific application task.

The application of this useful embedded system also extends in the medical field. Our project is designed with an aim to solve the problem of OSAS. OSAS is potentially serious sleep disorder in which breathing repeatedly stops and starts during sleep. Several type of Sleep Apnea exists, but the most common type OSAS, which occurs when your throat muscles intermittently relax and block your airway during sleep.

OSAS occurs when there are repeats episodes of completed or partial blockage of the upper airway during sleep. During an OSAS episode, the diaphragm and chest muscles work harder to open the abstracted airway and pull air into the lungs. Breathing usefully resumes with a loud gasp, snort or body jerk. These can interfere with sound sleep .they can also reduce the flow of oxygen to vital organs and cause irregular heart rhythms. Till date there is no permanent treatment to cure this syndrome. The patient suffering from this syndrome is given forced air artificially. This forced air keeps the patient's airway passage open and helps them with a regulated air flow for breathing,^[2]. Though it gives a temporary solution to this problem and many system exists the patient's find it not ease to use.

2 EXISTING SYSTEM

There are two existing system we have analysed through literature survey

2.1 POSITIVE END EXPIRATORY PRESSURE

Positive end expiratory pressure is the pressure in the lungs above atmospheric pressure that exists at the end of expiration,^[1].The two types of PEEP are:

1)Extrinsic (Applied)PEEP

2) Intrinsic (Auto)PEEP

Pressure that is applied or increased during an inspiration is termed Pressure support.

Limitation are:

Decrease in systemic venous return.

Pulmonary barotraumas can be caused.

2.2 CONTINUOUS POSITIVE AIR PRESSURE:

CPAP device apply continuous positive airway pressure throughout the breathing cycle. Thus the ventilator itself does not cycle during CPAP ,no additional Pressure above the level of CPAP is provided and patients must initiate all of their breaths.It is most effective treatment for OSAS ,in which the mild pressure from CPAP prevents the airway from collapsing or becoming blocked.

Limitation are wearing mask during entire night time,suffering from dry throat , pain over the face, and no Artificial Intelligence control is used.

3 PROPOSED SYSTEM

In our automated CPAP,we are monitoring the blood pressure and temperature value .If the pressure value is less than 90 and body temperature greater than 99.Arduino activates relay.relays turn on solenoidal valve which gives oxygen supply to patient from oxygen tank.Buzzer is used to alert nearby persons.GSM is used to send the alert message to doctor.LCD is used to display the sensed pressure and temperature value .

IJARMATE

Power Supply Unit

Step down Transformer (230 to 12v AC)

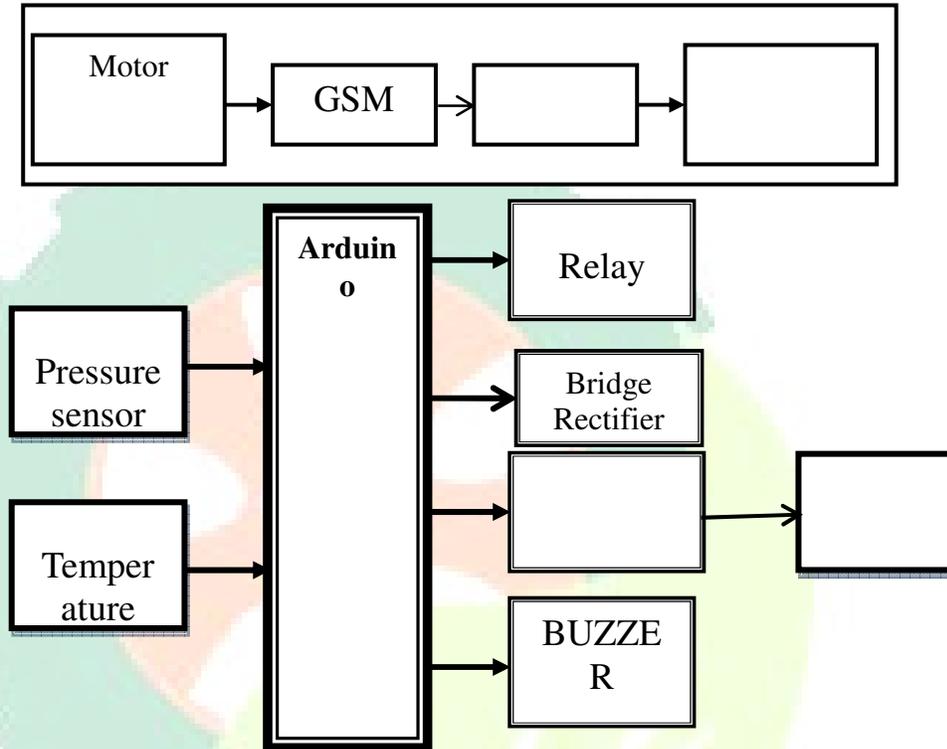


Fig.1.

Block diagram

3.1 ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328,^[3]. It has 14 digitalinput/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.



Fig .2.arduino board

3.2 PRESSURE SENSOR

The MP3V5050 series piezoresistive transducer is a state-of-the-art, monolithic silicon, pressure sensor designed for a wide range of applications, but particularly those employing a microcontroller or microprocessor with A/D inputs. This patented, single element transducer combines advanced micromachining techniques, thin-film metallization, and bipolar processing to provide an accurate, high level analog output signal that is proportional to the applied pressure.

Features

1. 2.5% maximum error over 0 °C to 85 °C
2. Ideally suited for microprocessor or microcontroller-based systems
3. Temperature compensated over -40 °C to +125 °C
4. Multiple porting options for design flexibility

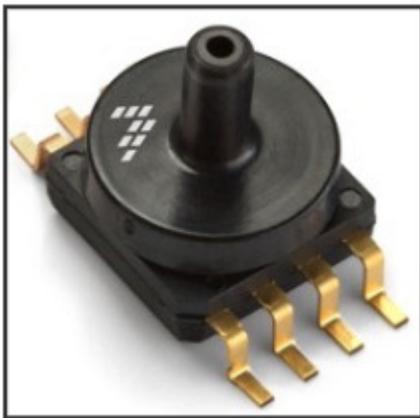


Fig .3.Pressure sensor

3.3TEMPERATURE SENSOR

The first slave connected to a temperature sensor LM35. This senses the temperature of an engine and provides the level of temperature. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage

over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

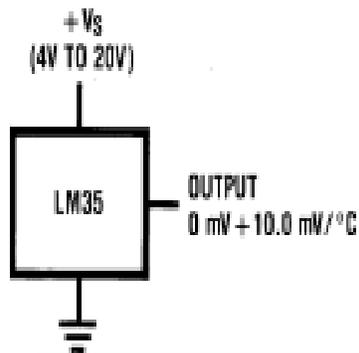


Fig.4. Temperature sensor

FEATURES

1. Linear + 10.0 mV/°C scale factor
2. Rated for full -55° to +150°C range
3. Suitable for remote applications
4. Low cost due to wafer-level trimming
5. Low self-heating
6. Low impedance output

3.4GSM

SIM800C is a complete Quad-band GSM/GPRS solution in a SMT type, which can be embedded in the customer applications,^[4]. It supports Quad-band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. With tiny size of 17.6*15.7*2.3mm, it can smoothly fit into slim and compact designs.



Fig.5. GSM Module

General features

1. Quad-Band 850/900/1800/1900MHz
2. GPRS multi-slot class 12/10
3. Low power consumption

4. Operation temperature: -40 °C to +85 °C
5. Class 4 (2 W @ 850/900 MHz)
6. Class 1 (1 W @ 1800/1900MHz)
7. Bluetooth: compliant with 3.0 +EDR

3.5LCD

LCD stands for liquid crystal display. They come in many sizes 8x1 , 8x2 , 10x2 , 16x1 , 16x2 , 16x4 , 20x2 , 20x4 , 24x2 , 30x2 , 32x2 , 40x2 etc . All the lcd's performs the same functions(display characters numbers special characters ASCII characters etc).Their programming is also same and they all have same 14 pins (0-13)or16pins(0to15).

ALL LCDs haveeight(8) Data pins,VCC (Apply 5v here),GND (Ground this pin),RS (Register select),RW (read - write),EN (Enable),V0 (Set Lcd contrast)

8-Data pins carries 8-bit data or command from an external unit such as microcontroller.

4RESULT

This paper presents a approach to supply necessary oxygen to the patient who is suffering from OSAS .This device is used to supply oxygen only when they are suffering from breathing trouble by measuring their body temperature and blood pressure value .The simulation has been performed and output has been verified successfully.

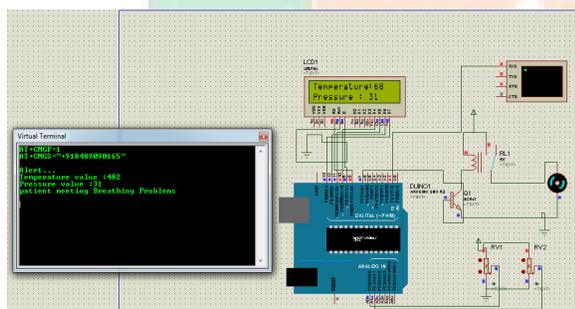


Fig.6.Simulation

Result

5CONCLUSION

We have designed, built, and validated an automated CPAP device that utilizes embedded technology to create a convenient, reliable, and user-friendly system. Initial research is to supply oxygen throughout the night by wearing the mask. This give an uncomfortable feeling to the patient and pain over the mouth and nose. This device is used to supply oxygen only to the patient when they are suffering from OSAS by measuring blood pressure and body temperature.we have used GSM to send message .Advancements toward CPAPcan be performed by accurately monitoring the patients body condition and send message to nearby hospital to provide first aid for the patient.

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