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CAN Bus Based Automated Effective Oxygen Administration and Dialysis Monitoring System

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***Abstract*—Oxygen is a lifesaving medication that ought to be offered with an organization to a patient who experiences oxygen lack to keep away from harmful impacts of over the top oxygen supplement and also to limit the presentation to hypoxemia. Dialysis is a treatment that done by healthy kidneys. This work aims to automate the process of administering oxygen delivery, power stream and to extend the continuous oxygen, power stream process beyond the Intensive Care units, and help in the process of weaning patient. In this work, a CAN transport based model for a Portable Automated Oxygen Delivery and dialysis observing System that comprises of two subsystems: an Oxygen Reader Subsystem and an Automated Adjustment Oxygen Delivery Subsystem, both conveying remotely and wirelessly. If the oxygen crossed underneath the limit level, then a SMS will be sent to office immediately to refill the barrel. In case any fault has been detected in oxygen distribution line, then the sub system will be automatically enabled by the controller, at the same time the intimation will be provide to family and to emergency recovery section. This system ensures enormous favorable circumstances to redesign the unmistakable quality existence of hypoxemic patients and furthermore restorative administrations advantage for oxygen conveyance affiliation.**

***Index Terms*— oxygen, dialysis, CAN bus, sub bag system**

I. Introduction

Healthy life implies that the person is mentally and physically fit and leading a regular life and performs daily activities at regular interval of time. When there is psychosomatic change in regular activity then the wellness of infant or person is not normal. When this come under the case of elderly persons they desire to lead an independent lifestyle but at this age they become prone to different accidents it is reported in recent times of development of a system to monitor the activities of an elderly person living alone has risk and is recurrent. So that help can be provided before any unforeseen situation happened. The system needed to record activities of infant or elder people at home by determining whether any change of regular activities have taken place and thus by taking preventive action by using sensor system for monitoring and assessing functional abilities of elderly behavior in smart home have been developed .This may help to reduce future health care cost. If any sensors or any medical equipment is included means there is a greater part provided for the embedded system. Embedded systems is computing system that are tightly coupled with hardware software integration, which are designed to perform a dedicated function. In embedded system the hardware and software are optimized for a particular application.

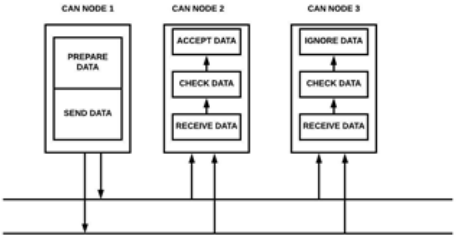

Fig. 1. CAN bus data loggers

In this project, our main objective is to care the patients health for monitor the oxygen inlet and outlet level to check the respiratory system. It also provides air sub bag system and dialysis rate monitoring system. We are going to implement our work in the CAN bus architecture which makes the system efficient to connect the sensors and the electronic control units (ECU). That helps the intimations about the patients health would be speedy and also gives the precision on the monitoring systems. In the CAN bus, we are passing the oxygen and monitoring the patients respiratory system whereas the oxygen flow, voltage flow and also the load that are monitoring and the corresponding actions to be taken when these parameter exceeds the limit. It also has the output valve to be controlled with the adjustment by the controller. CAN bus is the important part in embedded system which can be abbreviated as Controller Area Network is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in application without a host computer that supports distributed product and distributed system architecture. And the major thing is excellent error detection capabilities Many hospitals also keep oxygen in a variety of ways to treat a variety of ailments. Pediatric incubators help provide a safe environment for newborns and infants to develop when they are born prematurely, without the ability to regulate their heat or when they have wounds, to name a few. Doctors regulate the amount of oxygen in these areas as excessive amounts of it can damage newborns, though it is still a necessary element in these scenarios. The next thing is dialysis

to help impaired renal function. When your kidneys are damaged, they are no longer able to remove wastes and excess fluid from your bloodstream efficiently.

Wastes such as nitrogen and creatinine build up in the bloodstream. If you have been diagnosed with chronic kidney disease (CKD), your doctor will have these levels carefully monitored. Before dialysis, patients often felt weak and ill. Dialysis brings relief from these symptoms. This is the primary benefit of dialysis. When your kidneys fail, dialysis keeps your body in balance by removing waste, salt and extra water to prevent them from building up in the body keeping a safe level of certain chemicals in your blood, such as potassium, sodium and bicarbonate helping to control blood pressure Here both of the measurement are important for both infant and elder people, the patients health for monitor the oxygen inlet and outlet level to check the respiratory system. It also provides air sub bag system and dialysis rate monitoring system. Compensate the errors caused by different types of natural gases on the sensor's reading and also find the amount of gas [1]. The system measured the air temperature and humidity by sensors and giving similar performances [2]. A pulse oximetry sensor was designed for a baby's hand that measures oxygen saturation and beats per minute [3]. A voltammetric sensor showing an innovative approach for the measure of gas and vapors by the interaction of a screen-printed electrode system with the liquid solution which will measure O_2 and CO_2 [4]. An advanced portable and wireless-base incubator that measure the heart rate, oxygen saturation and temperature and also concentrate premature babies in the third trimester of pregnancy [5]. A spellbound imaging based coordinated answer for SPO2 estimation. The polarization channels are utilized to isolate light parts reflecting from profound and shallow layer of skin [6]. Coordinating an adaptable sensor and self-sorting out calculation to plan a distributed computing based cautioning gadget for blood spillage location. The warning gadget is utilized to recognize blood spillage levels amid dialysis [7]. A remote assistive innovation utilizing a coordinated adaptable sensor and virtual alert unit was produced to distinguish blood spillage amid dialysis therapies [8].The configuration measures and records top expiratory stream (PEF) or, in other words logging and checking of asthma persistent conditions by utilizing advanced mobile phone [9]. A coordinated Internet of Things design for brilliant meter systems to be sent in keen urban communities. This design incorporates power, water, and gas shrewd meters [10]. Estimating framework for early identification of haemolysis in hemodialysis (HD) and framework plays out an optical examination of the dialysis liquid with the end goal to evaluate the free HB fixation in the blood came back to the patient [11].

II. Security Requirements

Security requirements is the important thing for the medical equipment's security is important for sensor based design because the communication is between both the patient and coordinator and based on authentication only the coordinator will prescribe the medicine or treatment to the patient.

A. Privacy in Data

In this data privacy, they clearly explain about how the data is get hidden from others data is transmitted from sender to receiver or from receiver to sender the data should be always secret from others .by passing the data, it should not known to others for providing privacy the data passed to receiver and receiver must send the acknowledgement then only it is acceptable. Otherwise data loss can also obtained.

B. Data Integrity

The data must be protected from other external users or hackers, altering data without the knowledge of any consultant the situation become more pathetic for the patient .so handling the data with proper knowledge. The data loss can also obtained by bad communication. Lack of integrity is very dangerous to the patient.

C. Data Freshness

Another main thing is freshness in data because the older thing cause confusion to the both the transmitter side and receiver side for example: the patient having low pressure but the doctor viewing the older message and prescribing tablet for high pressure means the system is totally collapsed for that reason only we have to fresh the data in limited time

D. Authentication

Authentication is most important thing in security process the data transferred between both coordinator and patient the same thing the communication should not interrupt by others .both of them ensure with their identity authentication helps to confirm their identity to each other

E. Anonymity

It is also an important property to the security system ,the two conversation between un known people(patient & coordinator) it will hide the packet on both transmitter side and receiver side so the data is highly secured on both the side sometimes it can be allotted based on the acknowledgement the main thing is confidentiality

F. Secure Localization

TABLE I
SECURITY RISK TO BSN AND CORRESPONDING SECURITY REQUIREMENT

S. No.	Requirement	Risk Factors
1	Privacy Data	Stolen the data
2	Data integrity	Data loss
3	Data freshness	Improper old data
4	Authentication	Interrupt
5	Secure localisation	Wrong place

From the word itself we can begin the clarification giving restriction must be in secure frame since savvy following system permits to send inaccurate report about patient area by detailing false flag quality and different security dangers likewise happened, for example, information adjustment,

impersonisation, listening in and following and so on.

III. Proposed System

The exploration is particularly intended for tolerant wellbeing checking in the helped living and home condition. The Body Sensor Network (BSN) innovation is a standout amongst the most basic advances utilized as a part of GSM, IoT-based present day Healthcare framework. In initial segment fundamentally an accumulation of low-power and lightweight remote sensor hubs that are utilized to screen the human body works and encompassing condition. In second part strict security components is furnished to forestall pernicious collaboration with the framework. Fundamental mean to give consistent patient checking in-mobile, in-center and open condition observing, a few bio-sensors are put on patient's body.

Supplemental oxygen is a standout amongst the most ordinarily endorsed medicines in restorative consideration. At some random time, up to a fourth of hospitalized patients get oxygen treatment, and information from the United Kingdom propose that 34% of all emergency vehicle transports include the conveyance of oxygen. In spite of the fact that rules recommend that oxygen isn't a treatment for breathlessness without hypoxemia, in a Victorian Emergency Department review, the most widely recognized explanations behind oxygen organization were shortness of breath, chest torment and hypoxemia (in a specific order)

In this project, our main objective is to care the patients health for monitor the oxygen inlet and outlet level to check the respiratory system. It also provides air sub bag system and dialysis rate monitoring system. We are going to implement our work in the CAN bus architecture which makes the system efficient to connect the sensors and the electronic control units (ECU). That helps the intimations about the patients health would be speedy and also gives the precision on the monitoring systems. In the CAN bus, we are passing the oxygen and monitoring the patients respiratory system whereas the oxygen flow, voltage flow and also the load that are monitoring and the corresponding actions to be taken when these parameter exceeds the limit. It also has the output valve to be controlled with the adjustment by the controller.

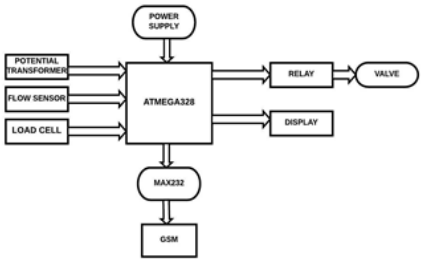

Fig. 2. Block diagram of a system

IV. Sensor Based Design

A flow sensor is a device used to measure the instant flow rate or quantity of gas or liquid passing through a pipeline. There are many types of flow sensor are being used in the industry as per their unique design. Flow meters are devices that measure the amount of liquid, gas or vapor that passes through them ,which means that the mass flow of fluid passing through a flow meter (A)is equal to the fluid density (r) times the volume of the fluid(Q). It should not exceed the level hundred.

Mass of fluid passing through flow meter=fluid density(r)

Force sensor can measure force between almost any two surfaces and are durable enough to stand up to most environments. when the force is unloaded ,its resistance is very high when a force is applied to the sensor, this resistance decreases .The resistance can be measured by a multimeter then applying a force to the sensing area .It should not exceed the level hundred. The potential transformer may be defined as an instrument transformer used for the transformation of voltage from a higher value to the lower value .This transformer step down the voltages to a safe limit value which can be easily measured by the ordinary low voltage instrument like a voltmeter, wattmeter and watt hours meters, etc. A potential transformer hypothesis is much the same as a hypothesis of universally useful advance down transformer. In any case, in real transformer, there must be a mistake in the voltage proportion and additionally in the stage edge among essential and auxiliary voltages.

V= [Analog read (volt)*0.445].

Arduino Uno is a microcontroller board and it has 14 digital input output pins .many of the connections are connected to the arduino board which initial condition such sensors also connected to that board and then LCD display is also connected to the board .here arduino board is also called as mother board and having the supply voltage as +12v. Then their cost is always less while comparing with other board then their compatibility and sensitivity is always high in manner arduino board is applicable in both hardware and software.

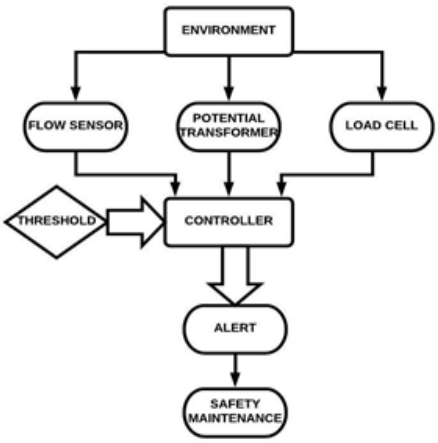

Fig. 3. Flow diagram of a system

TABLE II
THE BLINK PROGRAM

Developer	Arduino Software
Stable release	1.6.7 / 17 December 2015; 49 days ago
Written in	Java C and C++
Operating system	Cross-platform
Type	Integrated development environment
License	LGPL or GPL license
Website	arduino.cc

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. Power supply gives supply to all components. It is used to convert AC voltage into DC voltage. Transformer used to convert 230V into 12V AC.12V AC is given to diode. Diode range is 1N4007, which is used to convert AC voltage into DC voltage. AC capacitor used to charge AC components and discharge on ground. LM 7805 regulator is used to maintain voltage as constant. Then signal will be given to next capacitor, which is used to filter unwanted AC component. Load will be LED and resister. LED voltage is 1.75V.if voltage is above level beyond the limit, and then it will be dropped on resistor. Most electronic circuits require DC voltage sources or power supplies. If the electronic device is to be portable, then one or more batteries are usually needed to provide the DC voltage required by electronic circuits. But batteries have a limited life span and cannot be recharged. The solution is to convert the alternating current lose hold line voltage to a DC voltage source.

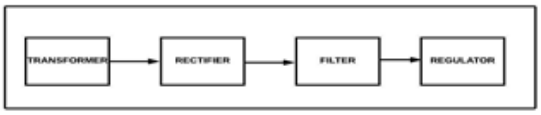

Fig. 4. Block diagram for power supply

MAX 232 is a widely known IC used for establishing serial communication between microcontrollers and personal computers (PC).It is a dual transmitter/dual receiver or signal conversion from controller .It is an integrated circuit which converts the signal from the RS232 serial port to the proper signal which are used in TTL compatible digital logic circuits. Relay is a switch which controls circuits electrochemically .The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it on or off. It is mainly used to control a high powered circuit using a low power signal and also control the signal which are from controller or several system controlled by single signal. GSM is abbreviated as Global System for Mobile communication ,it has become the global standard for mobile communication which is secure wireless system .GSM uses General Packet Radio service(GPRS) for data transmission like browsing the web or extension of GSM that enables higher data transmission rate. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications and LCD only displays all the sensor measurement such as voltage, level, and flow. Valve is used in sub bag system and it is the last part in this system, which is used to open and close the system. Valve can be denoted as valve 1 and valve 2 in simulation.

V. SOFTWARE POTRAYAL

The proteus design suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards .In this project there are two software included in this system they are arduino and proteus .arduino is used to compile the program and check the program having any error and then proteus, it show how the sensor is working and check the measurement is in normal or abnormal condition. Here arduino is the another tool to run the program which have written in embedded C. In this the program should compile without an error then only the program is applicable to proteus.

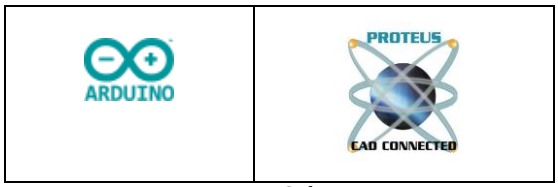

Fig. 5. Softwares

VI. CIRCUIT DESIGNING IN PROTEUS

As a matter of first importance, open the Proteus ISIS programming. In the beginning, it will look precisely the equivalent as in underneath picture. Presently tap on catch P as appeared in beneath figure. When you click this catch another window will spring up as appeared in underneath figure. This is where we look through our parts, as I need 7805 so I scanned for this segment and the Proteus has given me the related segments. When you get your coveted segment, essentially double tap on it and it will be included your database so you can utilize them The underneath picture demonstrates the segments which we are goanna use in this venture, so just look for every one of the parts and afterward double tap on them lastly you will get every one of the segments as demonstrated as follows: Now put these segments in the Proteus workspace and interface them. Structure the very same circuit as appeared in the beneath figure: Now our circuit in Proteus is prepared to utilize, the following stage is to compose a code for the Injecting hex record.

In this project there are two software included in this system they are arduino and proteus .arduino is used to compile the program and check the program having any error and then

proteus, it show how the sensor is working and check the measurement is in normal or abnormal condition. Then the major thing is the hex file .when the program is compile completely without error and the code is generated after compiling the program "done compiling". Then hex file is generated, then go the proteus circuit diagram, right click the arduino board and load the program .then run the program then check each sensor output.

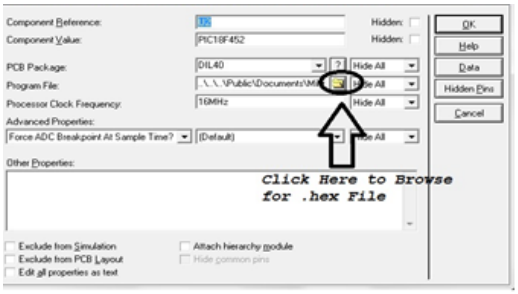

Fig. 6. HEX file

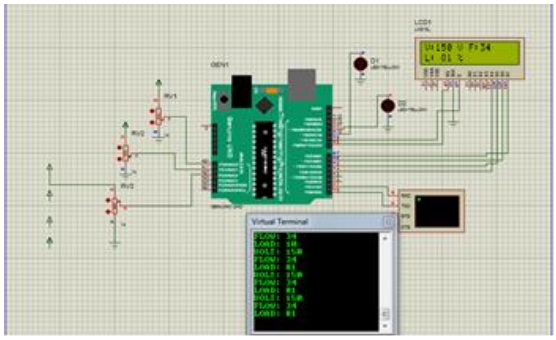

Fig. 7. Output response with virtual terminal

VII. Conclusion

In this project, our main motive is to care the patients health for monitor the oxygen inlet and outlet level to check the respiratory system. It also provides air sub bag system and dialysis rate monitoring system. In the CAN bus, we are passing the oxygen and monitoring the patients respiratory system whereas the oxygen flow, voltage flow and also the load that are monitoring and the corresponding actions to be taken when these parameter exceeds the limit. In future number of patient monitoring is increased.

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