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Diagnosis of Hypercapnia Using Carbonic Anhydrous Based Co2 Bio Sensor and Photoplethysmography

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Abstract- **It is a global need to realize noninvasive, simple rapid, selective, inexpensive, and portable assessment methods for diagnosis of diseases. Enzyme-based bio-sensing system, compared with traditional analytical methods, have all such potential attributes. This paper proposes carbonic anhydrase enzyme (CA) (E.C. 4.2.1.1) based cost-effective, highly selective and reproducible CO2 bios ensing system that can measure CO2concentration (ppm level) in expired breath accurately to give valuable information for assessing the respiratory disorders of the subjects. CA is extracted from spinach leaves and immobilized on an electrode assembly. The assembly generates asensible electrical signal (mV) when brought in contact with the aqueous CO2. The sensor characterizes a linear response from160 ppm-2677 ppm of CO2 concentration dissolved in water, good sensitivity (~0.132mV/ppm) with excellent fast response time within 12 sec. The features include repeatability, shelf life(~5 months), re-usability (~ 20 times) and selective responsiveness' the CO2 molecules in the exhaled breath. The feasibility for the use of the biosensor in a suitable set-up for home based monitoring of CO2 in exhaled breath has been proposed and justified. The device showed a good correlation between there results obtained from the sensor and established clinical test.**

I. INTRODUCTION

It is a global need to realize noninvasive, simple, rapid, selective, inexpensive, and portable assessment methods for diagnosis of diseases. Hypercapnia, also known as hypercarbia and CO2 retention, is a condition of abnormally elevated carbon dioxide (CO2) levels in the blood. Carbon dioxide is a gaseous product of the body's metabolism and is normally expelled through the lungs The system generates a sensible electrical signal (mV) when brought in contact with the aqueous CO2. The features include repeatability, shelf life, re-usability and selective responsiveness to the CO2 molecules in the exhaled breath. The device showed a good correlation between the results obtained from the sensor and established clinical test.

suppliers. Applications grant both patients and suppliers to have passage to reference materials, lab tests, and therapeutic records utilizing cell phones. The objective of predictive analytics is to help organizations change information into significant bits of knowledge that can enhance business choices. Increased worldwide competition and the requirement for maintainable development are pushing increasingly organizations to adjust analytical methodologies for business insights. Healthcare associations like never before are being seen utilizing analytics to devour , distinguish and apply new insights from data. Innovative analytical strategies are being utilized to drive clinical and operational enhancements to meet business challenges

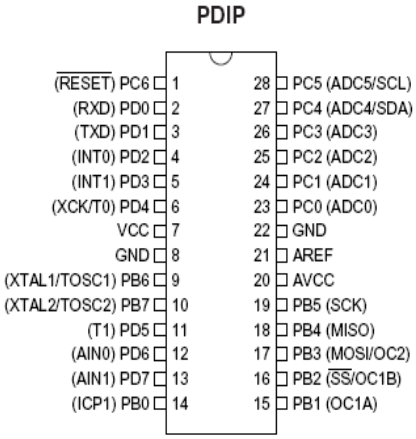
A chronic condition is a human health condition or affliction that is continuing on or for the most part reliable in its things or an ailment that goes with time. While peril changes with age and sexual introduction, most of the typical chronic ailments in the US are brought on by dietary, lifestyle and metabolic danger calculates that are similarly charge of the resulting mortality. Nonattendance of access and defer in getting care result in all the more horrendous results for patients from minorities and underserved populations. Those obstructions to remedial thought confound patient monitoring and movement in treatment

II. HARDWARE

Hardware system is constructed with power supply unit, Microcontroller –Atmega 8A which is High Performance, Low Power AVR, Advanced RISC Architecture and High Endurance Non-volatile Memory segments. Load Sensor- 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. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range.

Co2 sensor

The carbonic anhydrates (or carbonate dehydratases) form a family of enzymes that catalyze the rapid interconversion of carbon dioxide and water to bicarbonate and protons (or vice versa), a reversible reaction that occurs relatively slowly in the absence of a catalyst. An enzyme present in red blood cells, carbonic anhydrase, aids in the conversion of carbon dioxide to carbonic acid and bicarbonate ions. When red blood cells reach the lungs, the same enzyme helps to convert the bicarbonate ions back to carbon dioxide, which we breathe out.



As the heart forcesblood through the blood vessels in the finger, the amount of blood in the finger changes with time. The sensor shines a light lobe (small high bright led) through the ear and measures the light that is transmitted to ldr.Radio frequency identification is a technology that uses waves to transfer data from an electronic tag,, attached to an object, through a reader for the purpose of identifying and tracking the object. Some tags can be read from several meters away and beyond the line of sight of the reader. A chronic condition is a human health condition or affliction that is continuing on or for the most part reliable in its things or an ailment that goes with time. While peril changes with age and sexual introduction, most of the typical chronic ailments in the US are brought on by dietary, lifestyle and metabolic danger calculates that are similarly charge of the resulting mortality. Nonattendance of access and defer in getting care result in all the more horrendous results for patients from minorities and underserved populations. Those obstructions to remedial thought confound patients checking and movement in treatment Photoplethysmography sensor

It is often used non-invasively to make measurements at the skin surface. Photoplethysmography (PPG) is a simple and low-cost optical technique that can be used to detect blood volume changes in the microvascular bed of tissue. The PPG waveform comprises a pulsatile ('AC') physiological waveform attributed to cardiac synchronous changes in the blood volume with each heart beat, and is superimposed on a slowly varying ('DC') baseline with various lower frequency components attributed to respiration, sympathetic nervous system activity and thermoregulation.

Liquid crystal display

Most common LCDs connected to the microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (and communicates directly with the LCD.

III. SOFTWARE

AT mega8

A low power of CMOS 8 bit microcontroller based on the AVR RISC architecture. By executing powerful instruction in a signal clock cycle. at the ATmega8 achieves throughputs approaching allowing the system . Voltage regulators keep a constant dc output despite input voltage or load changes.The two basic categories of voltage regulators are linear and switching.The two types of linear voltage regulators are series and shunt.The three types of switching are step-up, step-down, and inverting.

IV. APPLICATION INSTRUCTION

Health monitoring applications of wearable systems most often employ multiple sensors that are typically integrated into a sensor network either limited to body-worn sensors or integrating body-worn sensors and ambient sensors. In the early days of body-worn sensor networks (often referred to as "body sensor networks"), the integration of wearable sensors was achieved by running "wires" in pockets created in garments for this purpose to connect body-worn sensors. An example of this technology is the MIThril system. Such systems by design were not suitable for long-term health monitoring. Recently developed wearable systems integrate individual sensors into the sensor network by relying on modern wireless communication technology. During the last decade, we have witnessed tremendous progress in this field and the development of numerous communication standards for low-power wireless communication. These standards have been developed keeping in mind three main requirements: 1) low cost, 2) small size of the transmitters and receivers, and 3) low power consumption. With the development Eeg sensor and Bluetooth, tethered systems have become obsolete. The recently developed IEEE 802.15.4a standard based on Ultra-wide-band (UWB) impulse radio opens the door for low-power, low-cost but high data rate sensor network applications with the possibility of highly accurate location estimation.

Most monitoring applications require that data gathered using sensor networks be transmitted to a remote site such as a hospital server for clinical analysis. This can be achieved by transmitting data from the sensor network to an information gateway such as a mobile phone or personal computer. By now most developed countries have achieved almost

universal broadband connectivity. For in-home monitoring, sensor data can be aggregated using a personal computer and transmitted to the remote site over the Internet. Also, the availability of mobile telecommunication standards such as 4 G means that pervasive continuous health monitoring is possible when the patient is outside the home environment.

Mobile phone technology has had a major impact on the development of remote monitoring systems based on wearable sensors. Monitoring applications relying on mobile phones such as the one shown in Figure44 are becoming commonplace. Smart phones are broadly available. The global smart phone market is growing at an annual rate of 35% with an estimated 220 million units shipped in 2010. Smart phones are preferable to traditional data loggers because they provide a virtually "ready to use" platform to log data as well as to transmit data to a remote site. Besides being used as information gateways, mobile devices can also function as information processing units. The availability of significant computing power in pocket-sized devices makes it possible to envision ubiquitous health monitoring and intervention applications.

V. ADVANTAGES

Staying Connected: Wearables can alert you of messages, incoming calls, emails, and much more without having to constantly be checking your phone. It can help you locate your phone when it is lost, or even connect to IoT enables devices in your home (such as switching on the lights or controlling the a/c temperature). The possibilities for increased convenience and connectivity with wearable's are endless. Wearables enable convenient tracking of your data, health, and exercise habits for your overall well-being. This is bound to result in a healthier you, but many health insurance companies are also starting to offer added benefits for those who wear fitness trackers and health monitors. Moreover, employees with higher-risk roles, such as firefighters, mining, oil & gas employees, and others are now able to wear devices that can detect oncoming dangers, such as heart attacks or falls, and immediately send this data to an outside manager or technical specialist for assistance.Wearable are set to make our lives safer and more efficient. For example – staff in packaging warehouses can now wear wearables that will assist in streamlining their packaging duties and tracking goods that are being transported, or wear GPS tags that can automatically tell them the most efficient route. Or, imagine that pacemakers, detectors, and other medical wearable devices can simply be connected through the internet to alter proper response teams when an accident or something dangerous has occurred.

CONCLUSION

A CO2 biosensor has been successfully developed by immobilizing carbonic anhydrase enzyme on a combined electrode assembly determination of aqueous CO2 concentration.The proposed device has a reasonably good correlation with the reference device implying the results from the proposed biosensor are reliable. It exhibits a fast response,

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