International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 10 | Oct 2019 www.irjet.net p-ISSN: 2395-0072

Monitoring of Health Status and Regulating Patient's Breathing Practice

Indira Devi. K[1], Indira Kumar. M[2], Ishwarya. M[3], Jamuna. K[4], Gowtham. R.K[5], Prema. S[6]

[1,2,3,4,5]UG students, Department of Electronics and Communication Engineering, SNS College of Technology, Tamil Nadu, India.
[6]Associate Professor, Department of Electronics and Communication Engineering, SNS College of Technology, Tamil Nadu, India.

Abstract - *Asthma marked by attacks of spams in the bronchi of the lungs, causing difficulty in breathing. It is usually connected to allergic reaction or other forms of hypersensitivity. Asthma triggers is exposed to various irritants and substances that trigger allergies can trigger signs and symptoms of asthma. Asthma triggers are different from person to person and can include: Airborne substances, such as pollen, dust mites, spores, or particles of cockroach waste. So that we have developed this project to avoid this causes using python based game module. Today every people do not follow the meditation regularly so that we put forward idea to develope asthma prevention device which is used to reduce the lung breathing with respiration level changes. Breathing monitoring is done with the help of Raspberry pi and python GUI game is developed to in order to display the sensor values. The result of the breathing level is stored in sqlite3 database which helps to plot the graph of output of sensor.*

Key Words: Raspberry pi, mic sensor, tft display, mcp3008.

1. INTRODUCTION

In this current status, asthma is a growing problem. According to World Health Organization around 300 million people were suffered from asthma and it will increase to 400 million by 2025. The people like infants, pregnant woman, elders, adult and toddlers suffer from asthma. So many people have suffered from chronic lung diseases. Asthma is more common in urban and rural areas. Asthma is mainly caused by smoking, dust particles and air pollution. Due to no ventilation of air the patient suffered from breath problems. Usually elder people suffered a lot. In most of hospitals, the patient's are not monitored at correct time. So with help of new technology we are going to monitor the patient's asthma level without the help of doctor.

People who are suffered from asthma are needed to check their conditions regularly. So we are using a temperature sensor to monitor the patient's body temperature and also using that we can able to monitor the rate of respiration. The normal respiratory rate of a person is from 15 to 20. The respiratory rate which is less than 12 is called bradypnea and greater than 30 are called tachypnea. The respiratory rate at zero for a person is referred as sleep apnea.

Every time patient's need doctor/medical professional's help is needed to monitor the respiratory rate. If doctor is not available at the required time, it would be tough time to deal with.

Internet of things is a growing technology which is used to monitor the patient's respiratory rate. The patient's respiratory rate is sensed based on temperature of inhaled and exhaled air. The data is displayed in a webpage using wired Ethernet cable communication. It helps to monitor the current health status of the patient.

Nowadays asthma patients do not take breathing exercise regularly. So we are providing a different approach to regularly do breathing exercise using a game application. The aim of the project is to create a simple asthma monitoring system using mobile phone as a platform. With the help of that game asthma patients can reduce the level of asthma by taking that exercise. A spin ball game is introduced where according to the breathing level the movement of ball occurs. The game is designed in such a way that it sets target on a regular basis. When the target is achieved, the patient's breathing exercise is completed. Eventually, this method makes the patient to get into breathing practice regularly as a habit.

1.1 Asthma Triggers

Asthma will be triggered by some of the exposures to an allergen, such as tree, grass or weed pollen, dust mites, cockroaches. Asthma triggers may also include other common triggers which are irritants in the air, such as smoke or chemical fumes, and strong odours, such as perfume.

Asthma attack may also trigger the illnesses of a patient specifically the flu, sinusitis or even a mild upper respiratory infection. Asthma can also be caused by some of the symptoms which includes strenuous exercise, extreme weather conditions and strong emotions that change normal breathing patterns. Symptoms or warning signs of a potential asthma attack will include an increase in your need for rescue medication, a worsening cough; shortness of breath which is particularly wakes up at the night time and diminished tolerance for exercise.

Some triggers particularly affect the children with asthma and will make the inflammation in their lungs even worse. One of the most frequent triggers for asthma attacks in very young children is suffered due to cold.

If anyone is affected by asthma, the airways in the lungs are usually inflamed. During an asthma flare-up these airways get even more swollen, and the muscles around the airways will become tighten. This leads to some of the triggers such as wheezing, cough, chest tightness and shortness of breath. Many people have asthma allergies, which can trigger asthma symptoms. Tobacco smoke is an irritant that often aggravates asthma. Asthma may also be irritated by using air pollution, strong odours or fumes. Many patients with asthma develop asthma symptoms when exercising. This is called exercise-induced bronchi constriction.

Some medications will cause or worsen asthma symptoms. These include aspirin or other non-steroidal anti-inflammatory drugs such as ibuprofen, and beta-blockers, which are used to treat heart disease, high blood pressure, migraine headaches or glaucoma. Emotional anxiety and stress will increase asthma symptoms and can even trigger an attack. Proper rest, diet and exercise are important for overall health and it helps in managing asthma. Viral and bacterial infections such as the common cold and sinusitis are also symptoms of asthma attack.

Asthma is a chronic disease, a systematic exercises should be followed. Asthma can be prevented by using proper medications and control symptoms. Two general classes of asthma medications are quick-relief and long-term controller medications. Quick-relief medications are used to provide temporary relief of symptoms by taking breathing exercise. These rescue medicines are bronchodilators, which help to open up the airways so that more air can flow through it. Bronchodilators are primarily short-acting beta-agonists administered by an inhaler or a nebulizer machine. Anticholinergic is also a type of medicine which may be used at times. Long-term controller medications are essential for many people with asthma. Necessary treatments are to be taken on a daily basis to control airway inflammation and treat symptoms in people who have frequent asthma symptoms. It includes taking medicines for long time.

2. Raspberry Pi

Raspberry Pi is a credit card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse. The Raspberry Pi helps the people to learn programming so it can be used for a range of tasks as diverse as emulating classic computer games or hosting online photo album. The An SD card inserted into a slot on the board acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output can be hooked up to a traditional RCA set, a modern monitor, or even a TV using the HDMI port. Raspberry Pi Zero runs under Raspbian, just like other Raspberry Pi devices. It is a lightweight operating system based on open source Desbian OS.

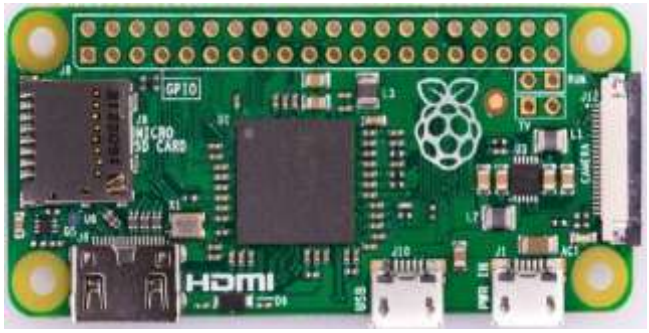

Fig -1: Raspberry pi zero model

2.1 MCP3008

MCP3008 is a 10bit 8-channel ADC (Analog to digital converter) which uses the SPI bus protocol and allows you to get the analog inputs with Raspberry Pi. It is cheap and don't require any additional components with it. It gives you 8 analog inputs and it uses just four pins of Raspberry Pi excluding the power and ground pins. MCP3008 is a 10 bit ADC so it will give us output up to (2 to the power of 10) = 1023. So the output will be a range from 0-1023 where 0 means 0V and 1023 mean 3.3V. The MCP3008 connects to the Raspberry Pi using a SPI serial connection. We can use either the hardware SPI bus, or any four GPIO pins and software SPI to talk to the MCP3008. Software SPI is a little more flexible since it can work with any pins on the Pi, whereas hardware SPI is slightly faster but less flexible because it only works with specific pins.

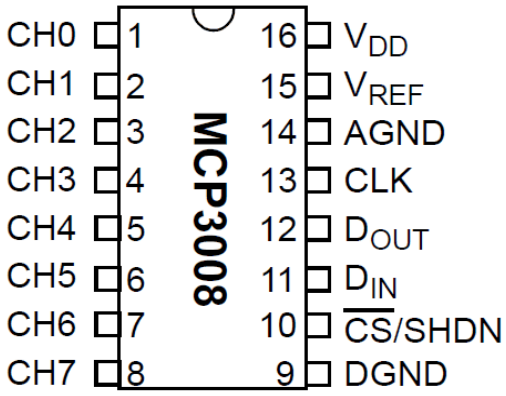

Fig -1: MCP3008

2.2 TFT display

A thin-film-transistor liquid-crystal display is a variant of a liquid-crystal display that uses thin-film-transistor technology to improve image qualities such as addressability and contrast. TFT displays or thin film transistor displays utilize simple chemical and electrical properties to create a visible image on screen. Utilizing an electrical charge that

causes the liquid crystals to change their molecular structure allowing various wavelengths of backlight to pass-through. A thin-film-transistor liquid-crystal display is a variant of a liquid-crystal display that uses thin-film-transistor technology to improve image qualities such as addressability and contrast. A TFT LCD is an active matrix LCD, in contrast to passive matrix LCDs or simple, direct-driven LCDs with a few segments.

2.3 Existing system

The breathing of asthma patients are monitored only in the hospitals using the medical equipments. Using various sensors like temperature sensor, humidity sensor, gas sensor the parameters are measured and the condition of the patient is monitored. The sensors are interfaced with the microcontrollers and operated. The results are either displayed in LCD displays or the measured values are connected with the web server and then results are displayed. This method helps only to be aware of the patient's current scenario. It does not help the patients to monitor the breathing practices on a regular basis. Following correct breathing practice is very essential which reduces the risks.

In the existing system, sensors are used to know about the patient current health status. Microcontroller is used to interface the sensor modules and program is dumped into the controller. The values of the sensor are saved and displayed using LCD display. Health condition of the patient is compared with the previous medical histories. Patient's situation is known and the condition is checked whether it is under risk or normal. This method helps to know about the patient present situation. However, it doesn't provide any approach to monitor breathing practice.

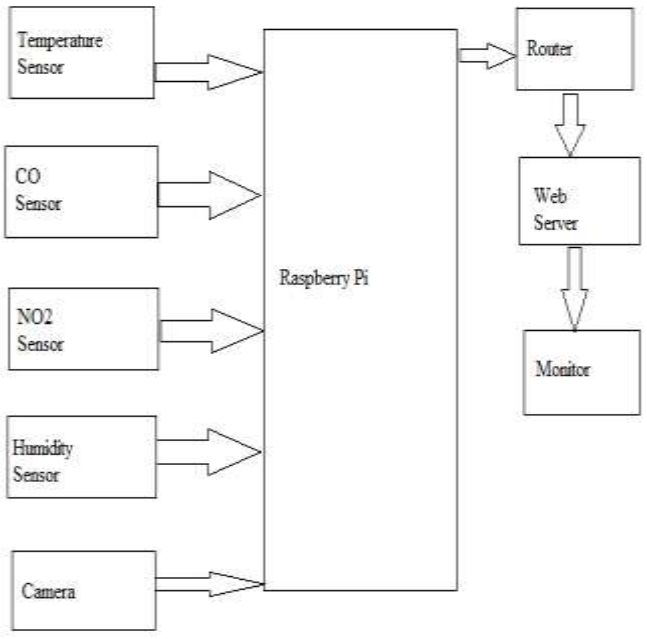

Fig -3: Existing System Block diagram

2.4 Proposed system

We put forward an approach to the patient's affected by asthma. The person's health status is monitored and as one of the treatment of asthma, breathing practice is performed. In today's world people find it difficult to regularly do meditation. The game is developed in order to make meditation as a healthy habit. The game deals with breath control monitoring, in order to regularize the work it sets a target for each day. When a person engage themselves into this game it makes even more comfortable to do exercise. This data is accumulated in the database. The data serves as an evident to the doctors to check onto the breathing practice. It is checked by the doctors by accessing with separate admin id, which consists of patient's detailed breathing practice summary. The method is programmed using python and backend process is proceeded with SQLite3. The results are plotted in the form of graph where it has time duration spent by the patient in the game application. This method is implemented using Raspberry Pi interfaced with sensor. It is a beneficial method in the field of healthcare, where it promotes self monitoring and care on their body.

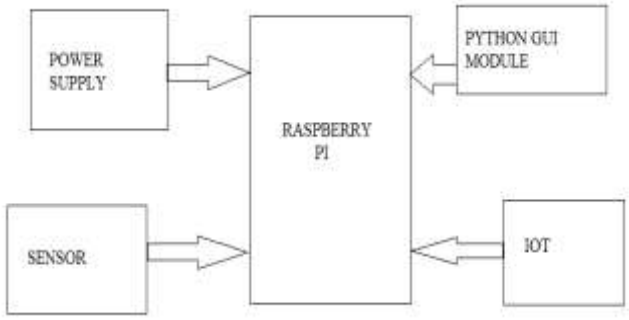

Fig -4: Proposed System Block diagram

3. Conclusion

We propose an idea of monitoring patient's health status in order to know whether they are at risk or in normal condition. It helps to regulate our body in a correct flow. This system can be employed in homes so that it helps patients to regularly check in their condition rather than going to the hospitals regularly.

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