Digitalized Dust Alert System for Asthma Patients and their Care Takers

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Abstract. Bronchial allergies can be a lifestyle-wide continual disease starting to unusual breathing organ abilities in addition to problem in respiration. Nowadays, persistent coronary heart failure has turn out to be an extreme hassle in fact. This takes place while coronary heart muscular tissue gets weakened, will become prone and in the end interferes with the all-herbal pumping interest of heart. This is slowly influencing an ever-developing population market, culminating in standing up for one of the good sized motives of a hospital life for elderly residents. Asthma remains associated with significant preventable medical complications and mortality. Asthma is a life time chronic disease that leads to anomalous functions and difficulty in breathing. In this work, a complete as well as integrated health care version is defined allowing Chronic Cardiac arrest clients every day accumulates vital warning signs in your own home and in addition sends them the use of Internet of Things (IoT). Internet of things (IoT) is a network based on the physical systems that can be exhibited in the form of typical embedded system including electronic devices such as sensors. The connectivity of the items can make it feasible for those artifacts to alert in addition to amassing data. Self-monitoring allows doctors/physicians and patients to have control over real time monitoring and to provide on-time treatment. Portable monitoring different input sensors like temperature, humidity, heartbeat, air quality are used to measure readings, and audio speakers, LCD display, Raspberry pi, WiFi server are used to monitor patients health and alerting authority person or physicians frequently through IOT Server. The design shows that using sensors and IOT servers on mobile phones, we can have sufficient and real time monitoring of the symptoms of the asthma patients. The real time monitoring by the doctors in combination with smart phones applications for the children and their care takers can prevent some of these deaths in real time.

Keywords: Internet of Things (IoT), Raspberry pi, Sensors, Asthma patients, Heartbeat, Temperature, Air quality

1. Introduction
Prosperity and success is fundamentally one of the general restrictions for humanity. At long last decade the social protection has pulled in tremendous measure of thought. The top point went into to make a reliable individual surveillance device to check that the prosperity office fix specialists can ensure an eye fixed at the individuals, who are both hospitalized and playing out their ordinary nearness responsibilities. In the customary method the human administrative experts play the basic role. Temperature, Heart Beat, Humidity, air quality sensors have been used for taking readings of asthma patients. Temperature sensors are used to calculate temperature in normal and excited conditions. Heart Beat sensor is used for heart beat readings in normal room temperature. Air quality sensor is used to calculate quality of air or pollution. Humidity is measurement of moisture conditions in room temperature. They need to take a gander at the impacted individual’s ward for basic assessment and proposing.

There are two significant issues related to this approach. Directly, the clinical association fix pros should exist nearby of the character continually despite today of all, the client stays surrendered in a social protection office. In order to improve the above issue, we can use progression in a progressively insightful procedure. Human administrations
identifying contraptions with Raspberry pi play an essential commitment, temperature sensors, heartbeat signals, and so forth. The measurements saved in a database and besides may be appeared in a site that can be taken by authorized persons. The clinical experts, impacted individual or their relative’s contributors may be given endorsement. The proposed asthmatic monitoring system will be capable of monitoring patient ubiquitously, since the system makes use of wearable sensors on the patients. In case of extrinsic asthma, the sensors is able to collect patient’s environmental data and send wirelessly to a connected mobile that will analyze and give measured readings gathered from different sensors.

2. Literature Survey

A couple of patients die frequently round the globe on account of not attending them on the right time by the care assistant. Raspberry Pi board is used on account of the fact the entryway or component of sensor enter gadgets which can be attached to the customer and to convey really model cost of a man to master PC through web. With the objective that fundamental fix can be offered short by using specialist from one another region despite sensible master can be enabled from some other locale to the character. They have taken Raspberry Pi as a gateway for a successive estimation of sensors. For coding, Python and furthermore C language are used [1].

IOT congregate and shares in sequence absolutely from patients to health concierge and has complete potential to collect, EP and scrutinize new numbers course nearer and accurately. Raspberry pi3 be obsessed with every one of facts from sensors, this entirely information relocate wirelessly to IOT website. The real time values will be habitually transferred to hospital's web server continuously. If any crisis in the functioning of serene subsequently an SMS will be sent to doctor of medicine and the patient's custodian doctor of medicine tin besides examine the tolerant order from the hospital's web server [2]. It reduces the break between tolerant and doctor plus reduces the price tag of health check of patient.

Present successful tending device it is important in order to perpetually computer screen the general patient’s physical confidence intervals. This method throws up type a device which has sensational capability in order to monitor physiologic percentages delight in uncomplaining consistence element each 10 seconds. A sensor node has attached on patient body to collect all the signals from the wireless sensors and sends them to the BSN care node. The attached sensors on patient’s body form a wireless body sensor network (WBSN) and they are able to sense the heart rate, temperature of surroundings [3]. The main advantage of this system in comparison to previous systems is to reduce the energy consumption to prolong the network lifetime, speed up and extend the communication coverage to increase patient quality of life.

There have been several locations consisting of information IOT is employed. Such as smart environment, smart home, smart city, smart parking, agriculture fields and medical fields. Using R-Pi patient’s heart rate, body temperature, Respiration rate and body movements are monitored. The R-Pi web interface acts as a server. Wherever these figures are untypical followed, the doctor will be informed of the signal. Server web page could be reachable anywhere not only to patients, Doctors but also for normal people and people taking care of the patient. Wireless Sensor Network (WSN) for monitoring patients physiological conditions continuously using Raspberry Pi for acquiring the observed patients physiological signal [4].

3. Proposed Methodology

With wearable recognizing unit and besides implantable body sensor frameworks will truly extend disclosure of emergency conditions in hazard patients. In the remainder of the couple of years, this issue has really pulled in colossal perception from examiners to decide the helpfulness of the IoT inside the clinical thought place by methods for using contemplating
distinctive sensible obstructions. As a result of this, there are unlimited activities, organizations, and models in the region. The IoT will impact several programming areas. The advantage in utilizing IoT services in this area are; wired association is disposed off, the clinical expert does no longer need to visit the man or lady to check him/her. Time is put something aside for every clients and doctor, very useful in crisis period, useful for remote areas, easy to apply, and the instrument uses a Wi-Fi inconvenience to deliver out the realities looking like signaling to a versatile device for better portability of the device [5-8].

A Wireless Sensor Network (WSN) for tracking individual's physiological conditions normally using Bluetooth exists. Below the physiological situations of the consumer's are obtained with the aid of sensors and the output of these sensors is transferred through Bluetooth as well as the identical needs to be sent out to the far off cordless display for retaining an eye fixed on the discovered affected individual's physiological signal. The faraway Wi-Fi display is constructed of Bluetooth and additionally Desktop Computer. The gauged signal needs to be sent out to the PC, which can be able to reveal. Bluetooth is having a better statistics transmission fee with a great deal less electricity consumption. The first treatment of the tool is that the wireless sensing gadgets are utilized to decide coronary heart rate, temperature and excessive blood strain from human frame utilizing bio sensors. Next gadget of the device is to interface the indicators using a microcontroller. WSN resembles Bluetooth, RF, Zigbee. In proposed method, temperature, Heart Beat, Humidity, and Air quality sensors are used to measure readings from asthma patients as shown in figure 1 and figure 2. Wi-Fi server is internally connected to Raspberry-pi controller and Audio speaker with MIC connected which gives alert to care takers or physicians frequently. The data will get updated in cloud IOT server with respect to time and gives sensor reading in graphical representation effectively. To asset individuals who might be impacted we had undeniably masterminded a contraption to play out their standard work outs with the help of the sensors like temperature level, unwanted smoke. The measurements are recorded and sometime later moved to the cloud for additional assessment. The records submitted to the cloud can be utilized by a clinical person or the guardian of the patient/individual. It is a smart portable sensor devices which are effectively used to connect on asthma patients and can take readings on timely basis and alerted when there is any emergency.

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![Figure 1: Working model.](image-url)
Heartbeat sensor is connected at finger tips of patients, it interfaces with Raspberry pi and is connected at B2 series in port. There are three connections coming out of the sensor which are the Signal(S), Vcc (3-5V) and GND. The sensing unit will be powered by the 3.3 V pin of Arduino as well as the signal pin will certainly be linked to Raspberry pi through the ADS115 ADC component considering that Raspberry Pi by default cannot review Analog voltage. The component therefore gives readings and thus depends on high temperature and comparator is connected to it.

MQ2 Sensing unit having 3 pins one is 3.3 V pin, second pin GND, third one is information pin. The sensing unit will be excited with the change in the air volume. In air quality sensor, LED1 & LED2 are present which are modulated when there is any unwanted smoke or pollution sensed and another terminal which is connected to audio APR96000 audio from different output alerts given when there is unwanted smokes. Users can monitor the air quality using smart phones connected through Wi-Fi server and can be monitored at any time.

The LM35 temperature level sensor is calculated for different readings and it is connected to raspberry-pi controller. LM35 has a function to turn temperature scale in to electrical quantities in the form of voltage being used as to find output with working range from 0 to 1.5V volts with an operating voltage of LM35 sensor which can be used between 4V to 30 V and is ideal for weather stations and also home automation systems. In this configuration we simply power LM35 and connect the output directly to analog to digital converters. Therefore it calculates body temperature and gives alerts in audio speaker. It depends up on the high and normal temperature conditions.

Place thumb finger at heart beat sensor and initialize test for temperature check, next air quality check, then humidity, and sensor readings are displayed on LCD. If in case of high temperature and unwanted smoke occurs at air quality sensor, moisture found in humidity sensor, an alert will be initiated through audio speaker module as shown in hardware interfaced circuit (figure 3).
The smart portable input sensors like temperature, humidity, heartbeat, air quality sensors are connected to raspberry-pi controller, are used to measure different readings in normal and excitation conditions. LCD displays different temperature, humidity, heartbeat, air quality sensor outputs. Patients data after being measured, if found any excited condition, an alert is sent to physician/doctor through wi-fi server which is connected to raspberry-pi controller that works and updates to cloud IoT Server webpage “thingspeak.com”.

4. Software & Flow Chart

To work with Raspberry pi, Raspberries OS is used in the work presented. Python is used for writing code for measuring, processing and executing the outputs. Thingspeak.com is used to analyze and visualize the new data, or interact with social media, web services and other services. Here we create different channels to analyze data from thingspeak channel and also to visualize the data stored in cloud IOT server. Sensors, or things, sense data and typically act, where thingspeak enables sensors, instruments, and websites to send data to the cloud where it is stored in either in private or a public channels by default, public channels can use data with others. The process is explained step by step as shown in flow chart 4:

- Step:1 – initialize “start” of which parameters are connected to the port.
- Step:2- Then initialize various parameters like temperature, humidity, heartbeat, air quality sensors given as inputs to controller and wifi server, LCD display, APR9600 Audio speaker is given for various outputs.
- Step:3- temperature, humidity, air quality, heart beat sensors have been connected to asthma patients for checking
- Step:4 – Take different reading of temperature, humidity, air quality, heartbeat sensors with respect to time under normal and excited conditions
- Step:5- There is temperature(45degrees), Heart beat(=72), air quality and humidity(below 100percent) sensors are under normal conditions for asthma patients
- Step:6- If temperature reading are above 45 degrees(as per given conditions) or high, there will be alert from voice audio speaker as “Temperature is high” message which will be given to asthma care takers or authorized persons or doctors through which
the patients data and measured parameters can be uploaded in IOT Server for every 20 second.

Step:7- When there is alert from voice speaker ,The Authorized person or doctor can able to see the temperature, humidity, air quality and heart beat excited graphs which gets uploaded in IOT Server with respect to time.

Step:8- Every sensor reading is uploaded in cloud server ,when temperature, Heartbeat, humidity, pollution values varies and sensor reading can automatically uploaded in cloud with in twenty seconds gap.

Step:9- Above measured values can be noted through WiFi server connected and values can be updated frequently ,when there is difference in readings.

Step:10- It will get “STOP” when there is normal condition.

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START

Initialize the variables and all ports

Read the temperature, heartbeat, humidity, air quality sensors or pollution measured values

Display the measured values

Exceed the condition

Upload in IOT server

STOP
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Figure 4: Proposed flow chart

5. Outputs & Results

Below are the output screen shot messages at different channels like temperature, Humidity, Heart Beat, Air quality or Smoke measured readings in normal and excitation conditions received to authority people. Using the model, temperature is measured and it is noted that high (above 60) which is in excited condition. As it is monitored, alert is sent to authorized person/doctor through above graphical representation in IOT server” thingsSpeak” webpage (Figure 5)

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Figure 5: High Temperature uploaded in server w.r.t time
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In figure 6, heartbeat readings are calculated from heart beat sensor which is in normal condition depends up on the patient's heart beat which is connected at the finger tip. If it increased beyond normal value (above 72), the alert has been given to the authoritative person or doctor through IOT server "thingspeak.com" webpage in graphical representation.

In figure 7, air quality or unwanted smoke or pollution has been measured using air quality sensor. If there is any unwanted smoke is produced near the asthma patient, an alert has been sent to authoritative person as excited condition. Excited air quality low alert has been updated in IOT server through “thingspeak.com” webpage in graphical representation.

In figure 8, humidity sensor excited time uploaded in Server.
In figure 8 shows that, when there is moisture in room temperature or on patients body, alert has been sent to authority person as excited condition through “thinkspeak.com” webpage in graphical representation.

6. Conclusion

A Wi-Fi healthcare monitoring machine the usage of utilizing cellular phones and additionally sensors is implemented in a global community with the help of Raspberry Pi. The devices in addition to IoT gathers and exchange information or data with each other, making it feasible to acquire, examine and also display information as it should be. Hence, IoT can be used in a well timed way to track the person and provide remedies, solutions, assistance and treatment. Self-monitoring allows doctors and patients to have control over monitoring in real time and to provide treatment on time. In addition to non-invasive sensing devices for picking up essential medical capabilities of a person, the suggested device can be boosted and even enhanced by using various intrusive devices. The design shows that we can track the symptoms of the asthma patients accurately and in real time, using sensors and IOT servers on mobile phones. The real time monitoring by the doctors in conjunction with smart phone applications for the children and their care takers can prevent some of these deaths in real time.

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