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BHOT WATCH : IOT BASED WEARABLE HEALTH MONITORING SYSTEM

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Abstract: An inventive wearable health monitoring gadget based on the Internet of Things, the BHOT Watch measures vital indicators such as blood sugar , heart rate, oxygen saturation,temperature, and it uses cutting-edge sensors, such as the DHT11 temperature sensor and MAX30102, to detect oxygen levels and heart rate. It also uses Bluetooth connectivity and Raspberry Pi Pico technology to send data to a mobile application that evaluates the data, including heart rate and other health factors.We used DHT11 sensor instead of sugar sensor ,to make the prototype compatible.If sugar sensor is available in market,we can replace DHT11 with sugar sensor. The BHOT Watch gives users vital health information and notifies them of their condition, including message information from the GSM module. If health metrics surpass preset thresholds, it automatically notifies emergency services (108) and sounds an alarm, notifying doctors and designated family members as well. This allows for remote monitoring and prompt interventions. Along with providing easy access to medical records and prescription management, the watch also computes body mass index (BMI) and offers personalised health insights. These features enable doctors to remotely monitor patients' health and prescribe medications as needed, improving the effectiveness, efficiency, and accessibility of healthcare.

Keywords: *IoT, Wearable Technology, Health Monitoring, Blood sugar, BMI, GSM, Emergency Response, Predictive Analytics,Personalized Recommendations, Holistic Health Management.*

I. INTRODUCTION:

The need for creative healthcare solutions has arisen due to the rising incidence of chronic illnesses. A potential technique for tracking vital signs and facilitating early intervention is wearable technology. The BHOT Watch is a state-of-the-art wearable gadget that can measure a number of critical parameters,such as blood sugar,heartrate,oxygensaturation,temperature. For those with chronic illnesses, this gadget seeks to enhance

healthcare outcomes, facilitate early intervention,

and offer real-time health information. The BHOT Watch was created to meet the increasing need for efficient treatment of chronic illnesses. People may take proactive measures to manage their health by using this gadget, which offers realtime health insights.

Note: We used DHT11 sensor instead of sugar sensor ,to make the prototype compatible.If sugar sensor is available in market,we can replace DHT11 with sugar sensor.

II. EXISTING SYSTEM:

The Heart Rate Oxygen Rate Temperature Watch (HOT Watch) is a wearable device that tracks the user's health condition and provides real-time updates. It uses sensors like MLX90614, AD8232, and MAX30100 to gather health metrics. The device employs Arduino technology and Bluetooth connectivity to transmit data to a mobile application. The Pan-Tompkins algorithm determines the user's heart rate accurately. The device includes a GPS sensor for location data. It can be integrated with electronic health records and used in clinical trials. The HOT Watch improves health outcomes and reduces healthcare costs. It's a comprehensive health monitoring solution. The HOT Watch employs sensors, such as the MLX90614 temperature sensor, AD8232 electrocardiogram (ECG) sensor, and MAX30100 oximeter sensor to gather health metrics from users. The HOT Watch employs Arduino technology and Bluetooth connectivity to transmit data to a mobile application and the Pan-Tompkins algorithm (PTA) precisely determines the user's heart rate.

III. COMPONENTS:

- Raspberry Pi Pico W
- NODE MCU
- MAX30102
- DHT11
- Buzzer
- GSM Module
- DC Power Supply
- LCD Display

IV. .WORKING:

1. Data Collection:

- The **MAX30102 sensor** collects real-time data such as heart rate, oxygen saturation (SpO2), and potentially blood sugar levels.
- The **DHT11 sensor** measures body temperature,humidity.
- **Note:**We used DHT11 sensor instead of sugar sensor ,to make the prototype compatible.If sugar sensor is available in market,we can replace DHT11 with sugar sensor.
- **Push buttons** are used for manual inputs like BMI calculation or navigating the interface.

2. Data Processing:

- The Raspberry Pi Pico W processes the data from the MAX30102 sensor.
- The Node MCU processes inputs from the DHT11 sensor, push buttons, and data received from the Raspberry Pi Pico W.
- Sensor fusion algorithms are applied to ensure accurate health metrics.

3. Data Display:

- Processed health metrics such as blood sugar,heart rate, SpO2,

temperature, and BMI are displayed on the LCD Display for the user.
- Alerts and notifications are also shown on the screen.

4. Connectivity:

- The GSM Module transmits health data to the cloud for storage and remote monitoring.
- It also sends message information and health alerts to emergency services (108), doctors, and designated family members if critical health thresholds are exceeded.

5. Alerts and Notifications:

The buzzer sounds an alarm if any health parameter surpasses safe limits, drawing the user's attention.

- Emergency services and medical professionals are notified for immediate intervention.

6. Remote Monitoring and Recommendations:

- Data stored in the cloud can be accessed by doctors for remote health monitoring.
- Personalized health insights and medication recommendations are provided based on the user's health data.

7. Additional Features:

- The watch computes BMI using manual inputs via push buttons.
- Users can manage medical records and prescriptions through the connected mobile application.

V. RESULTS:

Blood sugar , heart rate, oxygen saturation,temperature are the four main health factors that the BHOT Watch efficiently tracks and monitors. The watch continually and accurately measures heart rate and SpO2 levels using the MAX30102 sensor. Body temperature is accurately measured by the DHT11 sensor. The user's health metrics are continuously tracked and gives alerts as shown in table 1 .

Note: We used DHT11 sensor instead of sugar sensor ,to make the prototype compatible.If sugar sensor is available in market,we can replace DHT11 with sugar sensor.

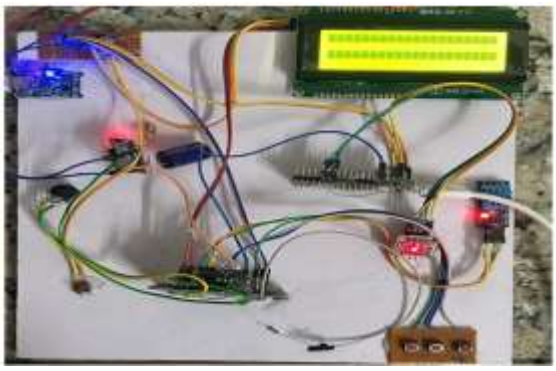

Fig.1. proposed system

PARAMETER	CONDITION	BUZZER	EMERGENCY ON LCD	MESSAGE ALERT
Blood sugar	high(>250)	on	on	sent to relatives,ambulance(ref no)
	Normal(70-250)	off	off	no message alert
	Low(<70)	on	on	sent to relatives,ambulance(ref no)
Heart rate	low(<60)	on	on	sent to relatives,ambulance(ref no)
	Normal(60-100)	off	off	no message alert
	High(>100)	on	on	sent to relatives,ambulance(ref no)
Oxygen Saturation	low(<95)	on	on	sent to relatives,ambulance(ref no)
	Normal(95-100)	off	off	no message alert
	High(>100)	on	on	sent to relatives,ambulance(ref no)
Temperature	high(>39.4°c)	on	on	sent to relatives,ambulance(ref no)
	Normal(36.1°c-37.2°c)	off	off	no message alert
	Low(<35.0°c)	on	on	sent to relatives,ambulance(ref no)
BMI	under weight (<18.5)	off	off	no message alert
	Normal(18.4-24.9)	off	off	no message alert
	Obese(>30)	off	off	no message alert

Table.1.Results of prototype

The BHOT Watch is a wearable device that monitors vital health parameters and triggers alerts for abnormal readings. It sends messages to relatives and emergency services, providing remote patient monitoring, elderly care, and emergency response. Accuracy, user interface, connectivity, and data privacy are crucial for its effectiveness.

Fig.2. Normal condition of blood sugar

When the Sugar value gets normal as shown in fig.2 , the buzzer does not gets activated so that GSM module also not gets activated and no alert message send to

the designated contacts.

Fig.3. emergency alert in LCD when blood sugar gets high

The BHOT Watch display shows an emergency Condition as shown in fig.3 when the Sugar value gets high and buzzer gets activated and GSM module gets activated and sent an alert message to the designated contacts as shown in fig.4.

Fig.4. GSM alert when blood sugar gets high

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.5.emergency alert in LCD when blood sugar gets low

The BHOT Watch display shows an emergency Condition as shown in fig.5 when the Sugar value gets low and buzzer gets activated and GSM module gets activated and sent an alert message to the designated contacts as shown in fig.6 .

Fig.6. GSM alert when blood sugar gets low

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

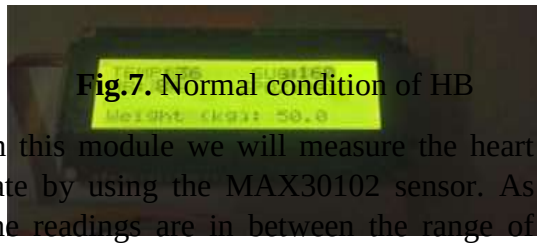

Fig.7. Normal condition of HB

In this module we will measure the heart rate by using the MAX30102 sensor. As the readings are in between the range of 60Bpm to 100Bpm, so the buzzer don't get activated. One of the normal condition reading of heart rate as shown in fig.7.

Fig.8. Emergency alert in LCD when HB gets low

In this module we will measure the heart rate by using the MAX30102 sensor. In this case study we will observe the low condition of the human heart rate. As the HB readings gets below 60Bpm it is an emergency condition , so the emergency condition displayed on the screen as shown in fig.8 and the buzzer gets activated

Fig.9. GSM alert when HB gets low

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.10. emergency alert in LCD when HB gets high

In this module we will measure the heart rate by using the MAX30102 sensor. In this case study we will observe the high condition of the human heart rate. As the HB readings gets above 100Bpm it is an emergency condition, so the emergency condition displayed on the screen as shown in fig.10 and the buzzer gets activated and the GSM module sends as shown in fig.11.

Fig.11. GSM alert when HB gets high

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.12 Normal condition of spo2

In this module we will measure the Oxygen Saturation by using the MAX30102 sensor. In this case study we

will observe the normal condition of the human Oxygen level. As the readings are in between the range of 95% to 100%, so the buzzer don't get activated. One of the normal condition reading of oxygen saturation as shown below fig.12

Fig.13. emergency alert in LCD when spo2 gets low

In this module we will measure the Oxygen Saturation by using the MAX30102 sensor. In this case study we will observe the low condition of the human Spo2 levels. As the Spo2 readings gets below 95% it is an emergency

condition, so the emergency condition displayed on the screen as shown in fig.13 and the buzzer gets activated and the GSM module sends message as shown in fig.14.

Fig.14 GSM alert when spo2 gets low

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.15. emergency alert in LCD when spo2 gets high

In this module we will measure the Oxygen Saturation by using the MAX30102 sensor. In this case study we will observe the High condition of the human Spo2 levels. As the Spo2 readings gets above 100% it is an emergency condition, so the emergency condition displayed on the screen as shown in fig.15

and the buzzer gets activated and the GSM module sends message as shown in fig.16

Fig.16. GSM alert when spo2 gets high

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.17. Normal condition of temperature

In this Module the temperature is measured by using DHT11 sensor. If the body temperature is in the range between 36.1^0 C to 37.2^0C then it is a normal temperature of the human body. So the Buzzer do not get activated. Here is the one of the normal condition or reading that was noted in the display as shown in fig .23.

Fig.18. emergency alert in LCD when temperature raises

In this Module the temperature is measured by using DHT11 sensor. When the Body Temperature starts increasing and cross 37.2^0C then an EMERGENCY condition will displayed on the screen as shown in the fig.18 and then the buzzer gets activated and the GSM module gets activated and sends ALERT message to the well wishers as shown in the fig.19

Fig.19. GSM alert when temperature raised

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.20. emergency alert in LCD when temperature decreased

In this Module the temperature is measured by using DHT11 sensor. When the Body Temperature starts decreasing b CY c as s zer g gets a to the well wishers as shown in the fig.21

Fig.21.GSM alert when temperature decreases

After inserting the sim in the GSM Module and activated when there is any emergency conditions,message will be sent to relatives,ambulance(reference no).

Fig.22(a). Selecting weight as 60kgs

Fig.22(b).selecting Height as 160 cm

Fig.22(c). Resultant BMI for Normal Weight

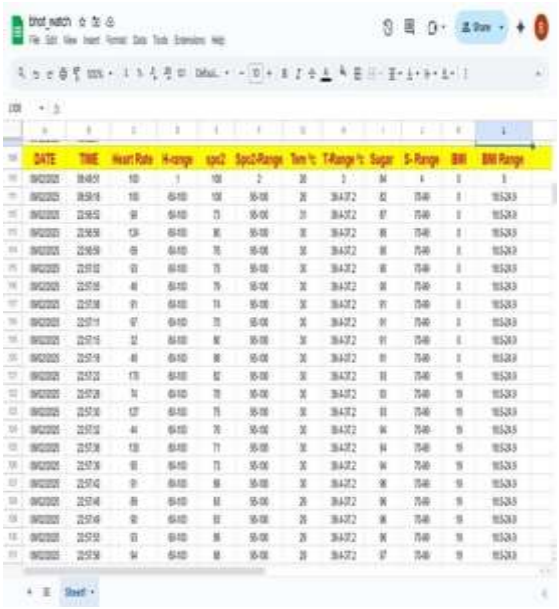

Fig.23. Stored Results in Data Sheets

VI. CONCLUSION:

The BHOT Watch is a complete wearable health monitoring device that combines wireless connectivity, microcontrollers, and sophisticated sensors. It monitors critical health indicators including blood sugar,heartrate,oxygensaturation,temperature. It uses a Raspberry Pi Pico, Node MCU, and GSM module to transmit data to mobile apps and the cloud with ease.The BHOT Watch has remarkable capabilities in identifying anomalous health metrics, sending emergency notifications to assigned contacts, and guaranteeing prompt medical attention. Along with standard values, sensor data are also stored in the cloud, offering important insights into user health patterns. Because of its creative, user-focused design, it is a useful tool that gives those with long-term medical difficulties comfort and security. Healthcare providers might also benefit from the watch as it allows them to remotely check their patients' health and intervene promptly when required.

Note: We used DHT11 sensor instead of sugar sensor ,to make the prototype compatible.If sugar sensor is available in market,we can replace DHT11 with sugar sensor.

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