Smart Bracelet

An Iot based Application.

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Abstract—**Our project aims to improve the lives of elderly people. The bracelet works as a personal assistant during daily life of the user, health status monitoring and alert him to abnormal conditions. Remote monitoring of patient health is increasing with advances in various types of health-related mobile applications. Vital signs such as heart rate, blood pressure and temperature are basic parameters, used to monitor the patient's health status. The designed medical kit consists of various sensors that are used for sensing and monitoring the health status of the patient using ESP32-Wroom32 microcontroller. The data from the medical kit is transmitted over the Internet and stored in the cloud server that helps to track the consistent health status of the candidate. The system starts monitoring the patient and sends an alert once the sensing parameters exceed the specified limits. The recorded values are transmitted via the Internet to a cloud server and alerts in the form of a tweet, to their family members.**

Keywords—sensors, ESP-32 Wroom32, microcontroller, cloud server

I. Introduction

In the modern era of communication and technology, electronic devices such as smartphones and tablets have become an essential tool in everyday life. These devices are used for both physical and wireless communication. The modern peers of the connecting world are the IoT. IoT is the extension of Internet connectivity into physical devices and everyday objects. It is so convenient that anything can be attached to it anywhere and anytime. As the number of aging individuals and patients with long-term illnesses increases the problems of old-fashioned medical facilities are quickly becoming more noticeable. Most importantly, medical facilities are only available in hospitals and it is difficult for the elderly or disabled to reach such facilities in the event of a disaster. Thanks to advances in technology, computing and monitoring sensors can now be built into small accessories; we really help the boom of smart devices, eg watches and bracelets. Several concepts, prototypes and devices ready for market presented with attractive features for young and adult people of all walks of life. The success of the smart bracelet is probably due to the instant fit on the wrist displays that are very effective for delivering alerts A smart bracelet could be very useful elderly people, none of these products seem explicitly address to their special needs. Indeed, several medical bracelets for health monitoring exist, but their appeal is limited the socio-emotional disadvantage these products have on old people

II. OBJECTIVE

A. Need of IoT in Smart Bracelet

IoT technology is amplified with sensors and specialists, with the Internet of Things estimated to include nearly 50 billion objects by 2020. The Internet of Things is typically expected to provide high-end connectivity of devices, systems and services that goes beyond machine-to-machine communication protects different protocols, domains and applications.

B. Basic Idea

With the help of an electronic bracelet, we can monitor the vital functions of the human body and can transmit data to the cloud and then to the app, it can not only monitor the vital functions, but also very convenient for patients, and it can also reduce the workload of medical staff and thereby minimize the risk of their infection.

III. SYSTEM ARCHITECTURE

Data Acquisition is performed using smart bracelet which consist of multiple wearable sensors that measure physiological biomarkers such as temperature, heart rate, location and gait (posture). Sensors connect to the network through an intermediary data aggregator or concentrator, which is usually smartphone placed near the patient.

The requirement for wearability is represented by physical limitations on the sensor design. Sensors must be light, small and should not hinder the movement and mobility of the patient. Also, because they need to run on small batteries that are part of the wearable package, they need to be energy efficient. Although the battery may be rechargeable or replaceable, for convenience and to ensure that no data is lost during recharging or battery replacement, it is highly desirable that they provide a longer period of continuous operation without the need charging or replacement. The low energy operation requirement can also pose a challenge for the quality of the data captured in terms of the achievable signal to noise ratio.

Data Transmission is performed using data transfer components of the system that are responsible for transferring patient records from the patient's home (or any remote location) to the Arduino IDE(software) with security and privacy assured, ideally in near real time. The sensor acquisition platform is usually equipped with a short-range radio, such as the components of the bracelet that is based on IoT-Cloud architecture which are used to transmit sensor data to the concentrator. Aggregated data is further transmitted to the app for long-term storage using an Internet connection at the concentrator, typically via WiFi or a smartphone's mobile data connection. The sensors in the data collection part form an Internet of Things (IoT) based architecture, as the data of each individual sensor can be accessed over the internet through a concentrator. Visualization is a key requirement for any such system, as it is impractical to ask clinicians to deal with voluminous data or analytics from wearable sensors. If wearable sensors are to impact clinical practice, visualization methods that make data and analysis available to them in an easily digestible format are essential.

Cloud Processing has three distinct components: storage, analytics, and visualization. The system is designed for long term storage of patient's biomedical information as well assisting health professionals with diagnostic information.

Data aggregated by the concentrator needs to be transferred to the cloud for long-term storage. Moving data storage to the cloud offers the benefits of scalability and on-demand availability for both patients and clinical institutions. Cloud hosting and analytics and visualization processing can also reduce costs and provide better diagnostic information.

Privacy is extremely important when storing individuals' electronic medical records in the cloud. Under the terms defined by the Health Insurance Portability and Accountability Act (HIPAA), the confidential portion of medical records must be protected from disclosure. When medical records are outsourced to the cloud for storage, appropriate privacy precautions must be taken to prevent unauthorized parties from accessing the information. Therefore, secure cloud storage frameworks have been designed for use with sensitive medical records

IV. HARDWARE

- **ESP32-WROOM-32 (ESP-WROOM-32)** is a powerful, generic Wi-Fi+BT+BLE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding. At the core of this module is the ESP32-D0WDQ6 chip

  - **SPECIFICATIONS:**

- **Microprocessor :** LX6 Tensilica (32-bit and dual core)
- **Operating voltage:** 2.2 to 3.6 V
- **Deep Sleep Current:** 2.5 µA
- **Flash Memory:** 4MB
- **Clock Frequency:** up to 240 MHz (in IDE only up to 80mhz)
- **Hardware Accelerated Encryption:** (AES, SHA2, ECC, RSA-4096)

- 28GPIO
- 3 UARTs
- 18 ADC channels
- 3 SPI interfaces
- 2 I2C interfaces
- 16 PWM outputs
- 2 8-bit DACs
- Internal SRAM : 520KB
- Integrated 802.11 b/g/n WiFi Transceiver
- Integrated Dual Mode Bluetooth (Classic and BLE)

- **PULSE SENSOR** is an alternate name of this sensor is heartbeat sensor or heart rate sensor. The working of this sensor can be done by connecting it from the fingertip or human ear to Arduino board. So that heart rate can be easily calculated. The pulse sensor includes a 24 inches color code cable, ear clip, Velcro Dots-2, transparent stickers-3, etc.

  - **SPECIFICATIONS**

- This is a hear beat detecting and biometric pulse rate sensor
- Its diameter is 0.625
- Its thickness is 0.125
- The operating voltage is ranges +5V otherwise +3.3V
- This is a plug and play type sensor
- The current utilization is 4mA
- Includes the circuits like Amplification & Noise cancellation
- This pulse sensor is not approved by the FDA or medical. So it is used in student-level projects, not for the commercial purpose in health issues applications.

- **NEO-6M GPS MODULE** contain tiny processors and antennas that directly receive data sent by satellites through dedicated RF frequencies. From there, it'll receive timestamp from each visible satellites, along with other pieces of data. It can track up to 22 satellites on 50 channels and achieves the industry's highest level of sensitivity i.e. -161 dB tracking, while consuming only 45mA supply current.

  - **SPECIFICATIONS**

- **Receiver Type:** 50 channels, GPS L1(1575.42Mhz)

- **Horizontal Position Accuracy:** 2.5m
- **Navigation Update Rate:** 1HZ (5kHz maximum)
- **Capture Time:** Cool start: 27sHot start: 1s
- **Navigation Sensitivity:** -161dBm
- **Communication Protocol:** NMEA, UBX Binary, RTCM
- **Serial Baud Rate:** 4800-230400 (9600 baud rate)
- **Operating Temperature:** -40°C ~ 85°C
- **Operating Voltage:** 2.7V ~ 3.6V
- **Operating Current:** 45mA
- **TXD/RXD Impedance:** 510 Ohm

- **ACCELEROMETER** sensor is a tool that measures the acceleration of any body or object in its instantaneous rest frame. It is not a coordinate acceleration. Accelerometer sensors are used in many ways, such as in many electronic devices, smartphones, and wearable devices, etc.

  - **SPECIFICATIONS**

  - Ultralow power: as low as 23 µA in measurement mode and 0.1 µA in standby mode at V_S = 2.5 V (typical)
  - Power consumption scales automatically with bandwidth
  - User-selectable resolution
    - Fixed 10-bit resolution
    - Full resolution, where resolution increases with *g* range, up to 13-bit resolution at ±16 *g* (maintaining 4 mg/LSB scale factor in all *g* ranges)
  - Embedded memory management system with FIFO technology minimizes host processor load
  - Single tap/double tap detection
  - Activity/inactivity monitoring
  - Free-fall detection
  - Supply voltage range: 2.0 V to 3.6 V
  - I/O voltage range: 1.7 V to V_S
  - SPI (3- and 4-wire) and I^2C digital interfaces
  - Flexible interrupt modes mappable to either interrupt pin
  - Measurement ranges selectable via serial command
  - Bandwidth selectable via serial command
  - Wide temperature range (−40°C to +85°C)
  - 10,000 *g* shock survival
  - Pb free/RoHS compliant
  - Small and thin: 3 mm × 5 mm × 1 mm LGA package

https://drive.google.com/drive/folders/1Lw59No1vyoDg-jibkHJU_RoKnhnf6oPr

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