AN IOT BASED HEALTH CARE SYSTEM FOR ELDERLY PEOPLE

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Abstract:

There is a rising concern in designing options for elderlies residing in a society with an increased population ageing. IoT is a revolutionary phenomenon that transforms our life entirely as well as aims to revolutionize current healthcare into a more individualized, precautionary and inclusive approach to treatment. In order to integrate these two main problems, this research provides an IoT-ready approaches for elderly living treatment that can track and record critical details for patients in emergencies and include protocols for activating alarms.The strong low / low-cost / wireless capabilities make this approach into a secure and convenient wristband, perfect for anywhere and anywhere. There has been a strong device efficiency for incorporated functionalities and an overall battery life time of 306 hours (around 12 days) has been reached with respect to autonomy. Without the need of the out - of-range alarm, the device has demonstrated its output within a distance of 60 metres.
Keywords: Health Care,Internet of Things (IoT), Monitoring Wristband,ElderlyLiving Assistance

1   Introduction:

The planet undergoes a technical revolution that has become unparalleled, from disconnected networks to all-embracing internet 'stuffs' that produce and share massive quantities of useful data. A digital phenomenon that transforms our daily lives, boosts market efficiency and strengthens policy efficacy, the latest model is widely recognized as the IoT. At the time of the IoT, ordinary items are cleverer and assume an significant role in infrastructure surroundings.This thriving integrated system is a pledge to follow a wide variety of applications of technical, economic and social possibilities from a normal clever street lamb to a difficultcityor elsefrom an efficient manufacturing device to an intricate clever factory.

One significant field where IoT has provided big improvements and huge implications for healthcare systems. In the field of healthcare research, the implementation of the usage of

information and communication technology has demonstrated a range of benefits of continuous health surveillance, and the IoT model allows more responsive, supportive and integrated treatment where patients track and control their own wellbeing.IoT has the ability to contribute to a wide range of medical uses, including virtual health control, chronic illnesses, personal wellbeing and wellness as well as pediatric and elderly care. The healthcare of elderly people and disabled individuals, recognized as Ambient Assisted Living (AAL) become particularly relevant in this broad range of applications because of the projected pace of global population ageing. These approaches may be especially beneficial in rural areas where there is often a small and restricted number and supply of emergency vehicles with the right reaction.

Powerful development activities in IoT-based healthcare software, facilities and innovations have been conducted over the past several years. However, the foundations of wireless sensor networks (WSN) had their early moves in this path.The low cost aging living assistance program for secluded households was introduced by suntiamorntut et al., while Redondi et al. introduced LAURA, an automated client identification and recording network in health care facilities. The pattern, though, is to swap from ancient crafted methods to structured IP networks with the introduction of IoT.introduces and addresses an IoTaware Smart Hospital System (SHS) that offers the automated control and surveillance systems for patients, workers and biomedical equipment inside hospitals and hospitals. A program of IoT for home health treatment of elderly patients living with chronic heart as well as breathing disease has been developed.A single wireless sensor node is mounted, able to track cardiac rhythm, temperature, oxygen saturation as well as electrocardiographic signals. The Carestoreframework[14] is a modern open source application for streamlined distribution and customization of healthcare appliances. A part of the CareStore project, the Universal Recognition and Identification Framework (CRIP) provides sensor-based assistance to automatically recognize the patient and health equipment.

In the industry there are still several sophisticated adaptive applications for AAL. A system for the compilation of patient mobile cardiovascular telemetry (MCT) and tracking for cardiac attacks is the Body Guardian Cardiac. Data from a patient was identified immediately and wirelessly transmitted through a mobile to a control center.Doctors can use different portals, including PatientView and PatientFlow, to access their patient data and review updates on the web. Wellness[16] is a device incorporating cameras, smartphone alerts and home control to deliver secure and cost-effective living choices.
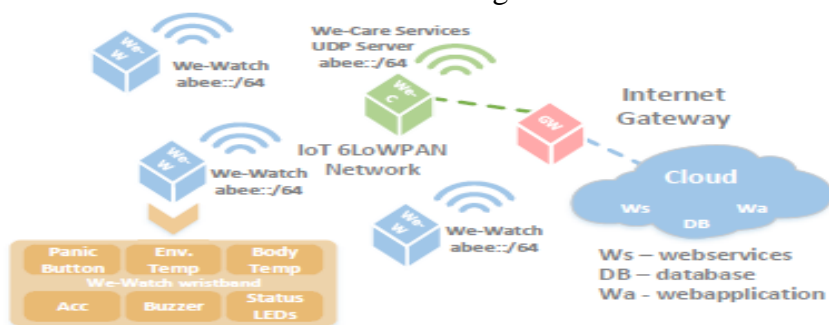

Figure 1. We – care over all structure

The solution alerts family members or appointed caretakers about sudden daily shifts that can signify an emergency by leveraging real-time information from in-home sensors. For older people, UnaliWear is a smart device. It has no control of safety parameters; however, it includes a Fall detection accelerometer and a continuous voice for successful safety alert.We created We-care, a wireless IoT-ready system for seniors, to lead to improved elderly living conditions, which helps patients to track and gather critical information and makes them accessible to medical staff as well as equipped caretakers. The information is gathered through a medical watch and sent to the control network, which prompts alerts of incidents such as accidents and the lack of important critical information.The device introduced was designed with low-power and low-cost specifications in mind, making it the solution that anyone would use at home. The simple connectivity with and incorporation into IoT-enabled networks, which have a low cost Platform, which is accessible for all, and the most essential functionality of other similar systems is a defining feature of our approach.

2   Related work:

The application of IoT technology in today's healthcare world offers physicians and nurses with ease as it extends to various medical areas (e.g., real-time tracking, patient experience management and treatment management). Some of the main applications of IoT innovations in the health care industry is the Body Sensor Network (BSN)[1] application where patients can be monitored[2] utilizing a minuscule and lightweight wireless sensor array.This approach will help the actions of elderly people in real time and track the health program. In this way the information gathered by different wearable devices is stored in real time in the central database which connects the right information with citizens, physicians and practitioners in the event of an emergency. This way,[3] the program will improve flexibility, reliability and also minimize health costs in order to maximize convenience, protection and the administration of an elderly life's daily routine.

We defined the main network specifications in real-time incident upcoming, bandwidth needs and data generation for a traditional remote health monitoring program. However, in order to understand the needs of this networks, in particular the bandwidth requirements and the data volume produced, we researched network connection protocols like the CoAPs, the MQTT and HTTP[4].A conceptual IoT-based healthcare network is evaluated with the planned authentication and authorization framework. This platform is constructed from a Pandaboard, a WiSMotes and a TI SmartRF06 frame. The CC2538 panel, which has been inserted into the TI board, serves as a clever portal. The suggested design is better than a state-of - the-art unified delegation design, which uses a better key management system[5] between sensor nodes and the intelligent gateway. In fact, because of the hierarchical design of the system, the effect of DoS attacks is that.

Health monitoring for healthy and supportive living is one of the paradigms that IoT applications can greatly enhance the health of older people. We present here an IoT architecture that is tailored to your healthcare requirements. The suggested design gathers the data and transmits it to the cloud[6] for processing and review. The consumer will provide input behavior based on the analyzed results.This paper introduces a novel hybrid approach to tackle some of the drawbacks of the principle of proof and its variants. The unnormalized[7]

conjunctive approach blends with the laws of a plurality. In case studies in computational modeling concerning behavior detection in an intelligent home environment, the suggested rule is tested.Within this paper, we suggest a general model of an insightful intensive care unit health network for tracking dangerous patients. The program offers clinicians and warnings in real time to improvements in[8] core parameters or patient behavior and significant adjustments in environmental parameters to take mitigation steps. The system includes details on these factors.

Real-time evidence from elderly gestures. The measurements of the module are interpreted and evaluated using a decision-making model focused on big data on a Smart IoT Gateway to provide high productivity in the detection of drops. In the case of a crash, an alarm is triggered [9] and the device immediately responds by transmitting alerts to the elderly classes. The framework also offers cloud-based infrastructure. There is a distribution facility that delivers patient services from a technical perspective.There are many elements of the current program. Just results from diverse sources i.e. detectors and hospital instruments for the ecosystem), will it continually track the health condition of older citizens. At the other hand,[10] should guarantee outside and indoor position in order to recognize the Elderly in and out of their home in real time. A program of remote thinking manages all data gathered for appropriate incidents and alerts.Throughout the first three levels, we primarily add. SecureData comprises two strategies for the first two layers: light-weight, FPGA hardware dependent cipher algorithm and hidden cipher exchange algorithm. We are learning KATAN algorithms and utilizing the concept of the hidden cipher communication system to preserve patient [11]safety, we are integrating and improving them on the FPGA hardware framework. We implement a centralized storage methodology on the cloud computing layer that requires a variety of cloud data servers to maintain the safety of the patient on the cloud computing layer.

The network comprises primarily of two parts: the data processing portion and the transmission function. In the data collection section we have planned the tracking scheme (tracking parameters and frequencies for each parameter) on the basis of medical expert interviews. The aim of sampling at various levels on a continuous basis is to provide several indications (blood pressure, ECG, SpO2, heart rate, pulse rate, blood fat and glucose)[12] and an environmental predictor (patient location). There are four methods to relay data avoiding risks, including for scientific research, correspondence and computational criteria.The RF identification (RFID) technology is now mature to deliver part of the IoT physical layer for personal healthcare through low cost, energy-saving and[13,14] disposable sensors in intelligent environments. A research on the state-of - the-art RFID is proposed for use in body-centered applications and for gathering details on the user's living atmosphere (temperature, humidity and other gasses).

2   Proposed method:

The software contains three core elements: (1) the watch We-Watch, (2) the Service Board for We-Care and (3) the cloud application. The We-Watch is composed of a discreet small bracelet which the elderly individual uses. This is responsible for tracking and gathering data from the available sensors and for submitting this safely to the We Care board that manages online sites and the cloud app when an Internet portal is open.A typical IoT

stack is introduced by the wireless network and all wristbands are allowed with IPv6 following the 6 LOWPAN procedure. The We-care boarding is answerable for the selection and administration of all device resources from the We-Watch wristbands. During an incident, the warning is activated by the attendant so that every potential question can be easily addressed. No internet access or a custodial provider that uses the same local network all the systems currently accessible operate on this board and transform the We-Care program into a single Internet self-governingportal.This table transforms into a readily accessible framework when connecting to the Web via an integrated portal, where all resources and functionality are reached and by the built apps online, from anywhere and at all times. This role helps the machine to track any elderly adult remotely without their physical appearance.

HARDWARE DEVICES

Figure 2 demonstrates the first We-Care version, made up of the We-Watch ring, the We-Care boarding and the We-Watch gateway. These are no examples of the Internet site and Web software.

A. We-Watch

The first We-Watch bracelet to be introduced is a Texas Instruments (TI) SensorTag. It comprises of a low-performance production forum with multiple MEMS on-board sensor consisting of the CC2650 MCU. The multi-standard Bluetooth MCU, powered by Contiki-OS, an IoT operating framework, incorporates the Bluetooth LE 4.0 as well as 6LoWPAN via the IEEE 802.15.4 Standard (2.4GHz).SensorTag is the perfect option for the implementation and testation of the We-Care wristband due to its compact low-power and scale (it will run over long durations while operated by one coin cell battery). While they do not have IP and help for the IoT Stack through Contiki-OS, they do not provide the help to other platforms, such as EZ430-Chronos. The Contiki-OS is used to support the whole 6LoWPAN protocol in the IoT stack.The required sensors, such as air as well as body temperatures, heat, humidity, light and obtained signal intensity indicator, can be gathered by the person We-watch wristbands.
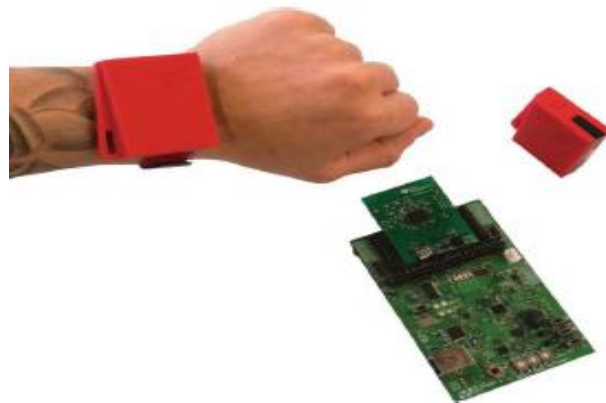

Figure 2. We – care Sample

First environmental and bracelet temperature info, RSSI, accelerometer as well as push buttons are used, however. Both together samples are submitted occasionally to the tracking / alert systems on the Although connected to a UDP port with a UDP central server on the We-Watch network, the We-Care panel.A variety of functionalities and resources can be incorporated with increasing sensor. The icon is intended for urgent reasons. This should be pushed to transmit problem alerts, for example in cases of an accident or neglect of the disabled individual, directly to the caretaker.

The RSSI value helps to monitor the wristband and helps to assess out of range / disconnected circumstances along with an audio signal provided by an on-board buzzer.

The We Watch wristband and the 6LoWPAN device in the We- Watch gateway are active on either side of the contact line. This parameter is functional. The Fall Monitoring device is applied by reading the data of the accelerometer used for detecting unexpected motion such as drops and also for checking up on any activity behaviors of the elderly. The Body Presence Detector Module may also be used for the temperature sensors for continuous measurement of ambiente and body temperatures, which can sense the body's presence. The device may send a message to the caretaker program if the wristband becomes removed, which will notify the condition.

B. We-Care board

Using the TI SimpleLink Kit CC3200 Launchpad, We-Care web services as well as Cloud Interface were created. A strong ARM Cortex-M4 CPU core and integrated Wi-Fi networking is supported in the CC3200 system-on-chip (SoC).We used TI-RTOS, a real-time TI microcontroller operating system for the device stack. TI-RTOS makes accelerated growth feasible by removing the need to create and manage device software for developers.TI-RTOS provides integrated TCP / IP, TLS / SSL stacks for Web, HTTP service and other networking protocols, which are designed to operate with the TI family Simple-Link. The we-care board will be used as a Wi-Fi access point for a station computer on the same network to link, access the applications available such as the telephone phone, or as a station for the Web and cloud infrastructure of the we-care program. Any caretaker software will view and track all the recorded wristbands on the network using the Station Profile on the We- Care screen.

The We-Care board manages the webserver for remote client connections, listening to port 80. Within an SDCard, the software client and data files including logs that contain the data obtained from the bracelets are processed.The We-Care Board does not operate or support routing services, that is, services which enable the devices to be nearby from any computer somewhat than from the We-Care Board, although it can link all we-watch devices from external networks (as long as the network offers IPv6 connectivity) for security determinations.
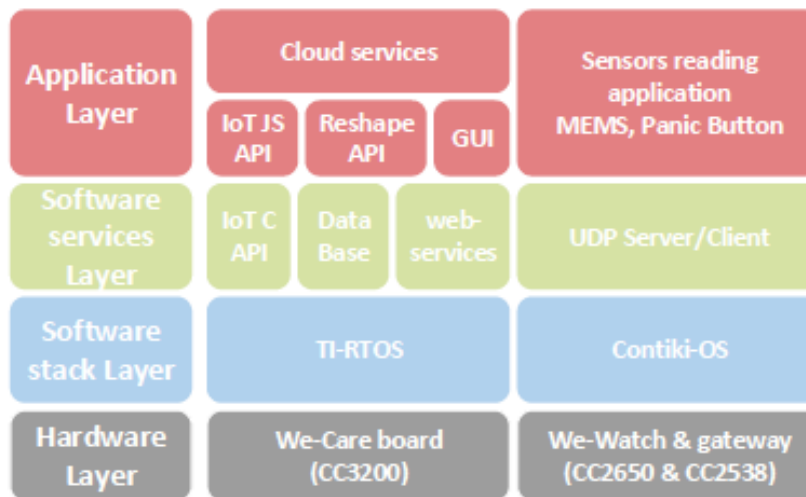
Figure 3. We-care Software Stack Structure

C. We-Watch gateway

The We-Care board wants to connect a 6LoWPan network via a transceiver equivalent to IEEE 802.15.4 such as the CC2538/CC2650, because the CC3200 accepts only the IEEE 802.11 wireless protocol. A contiki-OS UDP program is operating this 6LoWPAN Gateway that generates an IPv6 packets from every wristband on the network to the We-Care desk. On the UDP port 3000, the UDP server listens and acknowledges contacts on port 3001 from remote clients.

D. Wireless charging dock station

In order to incorporate We-Care, a wireless charging network has been created. Based on the reference design of the TIDA-00881[22] system, it simplifies battery charging, as it only allows a base station to responsibility it wirelessly when mounted on the base platform. This simple loading method allows the aging to power the We-Watch wanting cords or complicated systems.

SOFTWARE MODULES

The We-Care tech stack as seen in Figure 3. Four basic layers may be represented: equipment, software, cloud services as well as apps. The system layer contains the device board service packages (BSP). It framework is supplied with the Contiki-OS and TI-RTOS libraries for the various boards and equipment used, e.g. the We-Care ring, the We-Care portal and the We-Care monitor. The program is made of stacks and OS elements of the TI-RTOS and Contiki-OS protocols.The IEEE 802.11 as well as IEEE 802.15.4 applications are completely compliant and an IP-enabled stack is required to link the networking interfaces accessible. We only run an application for the service layer on the Contiki-OS side to allow message interchange between the We-Watch also the We-Watch gateway. This layer manages all web servers, protocols and databases on the TI-RTOS side.

Figure 4.Web application

And the IoT C API communicating with the System Layer IoT JS API. The Application Layer on the TI-RTOS provides a local web site graphical user interface (GUI) to show the device status and data and to connect with the clouds and remote applications through any network protocol communication.

A. We-Care webserver

The We-Care web-server has been specifically designed for the CC3200 low-power MCU, which can accommodate up to four customers simultaneously. Two primary APIs are designed in lightweight terms: the IoT.C, the IoT.JS and the Xml languages. The APIs communicate to fulfill the connectivity requirements of the Machine-to-Machine (M2 M).

B. We-Care web application

The We-Care Mobile Software was also developed to satisfy the system's low power needs. The data is enabled and sleep modes are disabled even if the programs are not used. This improves energy efficiency and thus extends the lifespan of the cell.The Software also facilitates the engagement of the caretakers with the We-Care program. It will operate without the need for external software or plug-ins and written in HTML5 and CSS3 on any platform or tablet.Instead of the SPI flash module on the monitor, program files are accessible directly from the SDCard through the File system API. It can be quickly changed since the fresh files can be transferred to the SDCard at any point and can be retrieved if necessary using the log data that is saved on the document.Figure 4 offers a quick guide to the caretaker that displays data from We-Watch wristbands such as the temperature of the body and the atmosphere and the Drop Alert feature that warns the carer whether the movements fell or sudden.

Figure 5. We-care Warning message

The colored lines next to the bracelet will say if this system is online (green). The bracelet IPv6 address is the default name, which may be modified to the necessary alias to make the identification simpler for the bracelet.For tension messages, a alarm message accompanied by a sound alert is shown on the application when the Push button is pressed (Figure 5).Additional warnings and notifications should be programmed to be sent to locations including the individual accountable and the medical response services, for example where the aged require immediate healthcare.

C. Securing the wireless communications

It is essential to protect wireless communications in IoT networks. We-Care technology requires data to be secure from unwanted users-who may interrupt IEEE 802.15.4 systems and/or insert fake network data that jeopardizes overall device enforcement.The basic 802.15.4 sets up optional cryptographic protection packages that have either anonymity, honesty or both with powerful cryptographic algorithms, including the ADE. We also used a link-layer cryptographic library for the IEEE 802.15.4 conformal radios (LLSEC) supplied by Contiki-OS to protect the wireless communications between the We-Watch wristband as well as we-watch portal, utilizing the accessible protection modules on-chap AES-128. This architecture is based on an Simple Broadcast Encryption and Authentication Pr software collection, and the implemented pairly setting-up systems.

3   Result and discussion:

A. We-Watch battery lifetime

In order to determine the energy usage of the We-Watch with various modes of service the experimental test was carried out. Battery existence can be estimated from the data received. While these MCU supporting sleep as well as deep sleep control modes as well as the Contiki-OS are capable of utilizing them, they are not allowed, so this information is not accessible (NA) This information is not accessible. As only four operating modes

were defined as the device specifications for 'always-on' functionality like sample sensors and message exchans with the we-watch gateway.

(1) Idle: This setting is the lowest current usage level which is disabled to conserve electricity during much of the working day. The contact in Idle mode is OFF, but ready to turn on if the We-Watch will connect with the message exchange or network upkeepportal.In the case of abrupt accelerometer movements (which could be falling) or the difficulty button pushing, CPU is stoppsed and we-watch messages to the We-Care board are automatically launched.

(2) Sensors ON: This mode displays the usual sampling of the sensors. The total current usage of 6.47mA requires 100 ms for reading all the sensors.

(3) TX Mode: The We-Watch sends data to the we-watch gateway after selection of sensors. This takes an average of 25.77 mA and lasts for a period of 5 m.

(4) RX Mode: The we-watch stays in this state after submitting the data to the gateway for 0.3ms waiting for a data acknowledgment response before heading back to Idle Mode. On average, the actual estimated intake was 33.12mA. This message is expected if contact failure with the we-care board is to be found and the condition is to be out of the control.

The active mode (Sensor ON, TX mode and RX mode) draws an average 7,463 mA in 0.105s and an Idle mode draws 0.760 mA in the 29,895s to establish a contact and sampling rate of 30 seconds (where the We Watch conducts all the above-mentioned operations). This results in a net average intake of 0.784mA. The average battery life is measured as follows with a typical rechargeable coin cell battery of 240mAh
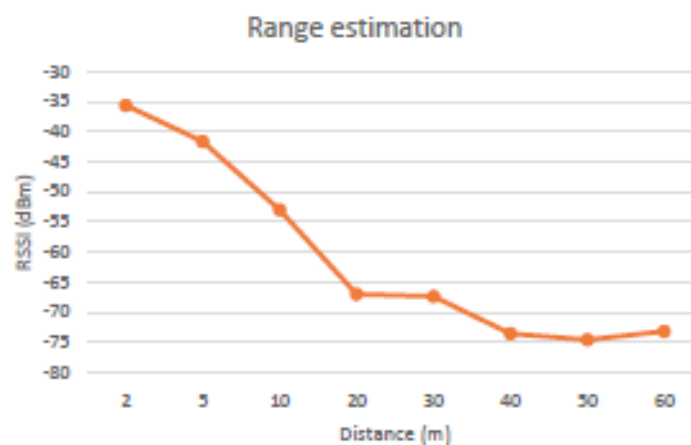

Figure 6. Range Estimation Test

$$BatteryLifeTime = \frac{BatCapacity(mAh)}{TotalConsumption(mA)} \quad (1)$$

$$BatteryLifeTime = \frac{240mAh}{0.784mA} \quad (2)$$

$$BatteryLifeTime = 306.12h \quad (3)$$

The battery life anticipated is approximately 306.12h, that is, approximately 12 days without maintenance or charging. This allows the maintainer ample flexibility, while retaining the device resources and controls, to remove the battery or We-Watch bracelet. When the old guy is ready to remove and upgrade the We-Watch itself, he will do so easily with the system-supplied wireless adapter.

B. Performance Checks

1) System availability: We run certain experiments with the existence and absence of the Internet Portal in order to check network functionality and its capacity to respond to evolving circumstances in the application scenario. From initial example, the We-Care board began with the Station profile and the maintainer will link to the device directly or whether he or she is on the same network. The We-Care board flips on the AP profile, extends its access to the web, when the Internet gateway becomes open.

2) Out of Range:

The network is still linked and the elderly are on the field. This feature guarantees If the We-Watch bracelet loses the connection to the We-Care board after a 60-minute trial time, the sound alert will be activated before the bracelet returns to its portfolio and is able to connect with the We-Care board again. This feature was tested in an indoor setting at the bracelet size max.The conducted checks, which activate the output detector, on the basis of measured RSSI, are shown in Figure 6.The association between the distance and RSSI is shown for comparison purposes, and will help determine the overall device range depending on the indoor climate. The device reach will go up to 60 meters until the output warning is activated in a typical operating setting.

5   Conclusion:

Throughout the planet, the technical movement to link thousands of devices has never seen before. The IoT is a revolutionary concept that enriches our daily existence and aims to bring about dramatic improvements and a huge impact on american healthcare while making for a more customized, efficient and integrated medical network. We-Care, a framework of IoT healthcare intended to track and collect critical data on elderly persons, was introduced in this article.In case of emergencies, the device will sense crashes and the lack of vital signs, causing warnings. The wearable system, which is integrated into a plain, detached and convenient band, provides the best option for all elderly people at home. The software application built gathers all the data that the wristband sends to the server and is also capable of alerting carers or medical staff remotely in the track of an emergency.The collected data

will subsequently be used for research to track the progress of their patients by medical personnel. The IoT program will coexist with current technologies for the WE-Care framework as it implements a structured set of protocols.

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