Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

WEARABLE DEVICES FOR STROKE PATIENTS DURING HEALTH CARE SERVICE DELIVERY MECHANISMS USING VEHICLE ROUTINE PROBLEMS WITH THE TIME WINDOW

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ABSTRACT: *In low- and middle-income nations, cardiovascular disease (CVD) imposes a significant cost burden. CVD is connected with a significant deal of suffering and loss of life, but it is also a major economic burden on developing countries. A comprehensive healthcare approach is proposed in this study, allowing patients with cardiovascular disease (CVD) to gather daily vital signs from wearable sensors anywhere and communicate them wirelessly. This makes it possible for doctors and specialists to keep an eye on their patients from a distance and to intervene as needed on a regular basis. Wearable sensors will have seven characteristics: electrocardiogram (ECG), pulse rate, body temperature, blood pressure, blood sugar level, oxygen saturation level, and movement of the patient. These parameters will be incorporated into the design. The sensors are linked to an Arduino and a Raspberry Pi so that vital indicators can be collected and sent to the intelligent web site via the Raspberry Pi +. It is possible for a CVD expert to see the critical parameters and keep tabs on any mobile device that is part of the same network. Whenever this parameter deviates from the normal range, it will immediately send a warning message to the patient's doctor. Patients' and doctors' personal data will be entered into a database and made available to other users. Hospitals linked to the system will have access to the web site. Using the wearable GPS vest, it's easy to attend to patients in an emergency while the intelligent online site calculates the shortest route with the lowest cost using the Geographical Positioning System (GPS).*

KEYWORDS: GPS: Geographical Positioning System, ECG: Electrocardiogram, CVD: Cardiovascular disease

INTRODUCTION

Despite a well-structured health system in Nigeria, the growth of Primary Health Care (PHC) has had little impact on the population's health experience, particularly in rural regions [16]. Nigeria was ranked 187th in terms of health status by the World Health Organization (WHO) out of 191 United Nations member states [26], [17]. This has sparked global alarm due to the country's dismal health state. It is not surprising that Nigerians travel to foreign countries for medical treatment due to the country's health system's

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https://doi.org/10.37745/ijeats.13

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

shortcomings. Currently, health care facilities are scarce, as are medical professionals, who are typically located distant from rural/remote locations. As a result, it is difficult for rural residents to access basic health care services or to receive medical assistance in a particular area of need. However, the majority of the country's primary health care centers are antiquated and understaffed with incompetent workers. This means that present health services are limited to treating common illnesses such as malaria and typhoid. Patients suffering from heart disease (cardiovascular) complications, a chronic ailment, would be forced to seek medical care in cities or perhaps abroad. According to the Journal of the American College of Cardiology, cardiovascular disease (CVD) is responsible for the majority of mortality associated with chronic disorders [15], [19]. Additionally, it was mentioned that; "Chronic diseases, which include cardiovascular disease, cancer, diabetes, and chronic respiratory diseases, account for nearly half of the world's disease burden. By 2030, it is anticipated that chronic diseases would account for seven out of ten fatalities worldwide, with cardiovascular disease accounting for the lion's share of these deaths "[20]. As a result, this prognosis focuses global emphasis on distant health care service delivery mechanisms, which include collaboration with scarce health professionals and the nearest registered general hospitals on how to correctly manage exceptional health problems. Additionally, it required rapid reaction to a patient in an emergency situation by utilizing vehicle routing difficulties with time constraints. The delivery of health care services is a critical component of every health system. Service delivery is a critical component in determining the health condition of a population and other factors, such as socioeconomic determinants of health. The actual organization and content of health care vary by country. Nonetheless, any well-functioning health system should include a comprehensive network of service delivery. A full spectrum of health care, tailored to the needs of the target population, is offered, including preventative, curative, palliative, rehabilitative, and health promotion activities. Healthcare accessibility Service delivery should be direct and lasting, without unnecessary financial, linguistic, cultural, or geographic impediments. Healthcare services should be accessible to the public, with a standard point of entry into the network at the primary care level (not at the specialist or hospital level). As appropriate, services may be offered in the home, the community, the workplace, or in health institutions. Medical care and the delivery of services will be planned to encompass all members of a designated target population, including the sick and well, as well as all income and social categories. Additionally, local area health service networks will be proactive and well-coordinated across provider types, care levels, and routine and emergency readiness. Information technology has the potential to minimize mistake rates, increase communication, make information more accessible, aid in diagnosis and monitoring, give decision assistance, and facilitate the implementation of guidelines and recommendations. The World Health Organization recently defined mobile health as "medical and public health practices that are facilitated by mobile devices such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices." Around 500 million smartphone users globally are expected to use mobile health services by 2015 [17], [26].

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The use of mobile devices to diagnose and treat a variety of ailments is expanding. Current mobile devices are well-suited for medical applications due to their rich multi-touch user interfaces, integrated accelerometers, location-sensing frameworks, fast CPUs, and widespread network connectivity. Other advantages of mobile devices include their portability and ability to be utilized at any time and from any location. The purpose of this article is to discuss the use of information technology and mobile health in the clinical care route for stroke patients, specifically their application in stroke recognition, transportation and triage, urgent stroke evaluation in the hospital, and rehabilitation. Additionally, we discuss the applications of such technology for healthcare providers and patients in a brief manner. This assessment, however, does not seek to cover all information technology challenges associated with electronic health records and wearable environmental monitoring devices. Solving the immediate problem with information technology will considerably lessen the need for patients, particularly stroke patients, to travel vast transit distances (abroad/internationally) in order to seek medical treatment and diagnosis. Referrals to hospitals will also be reduced. The causes of heart disease can be more successfully controlled by utilizing a remote medical consultant registered on the intelligent web portal to deliver mobile healthcare services to people in rural/urban locations at predetermined time intervals. Thus, it is necessary to arrange a doctor's visit slots in order to deliver healthcare services to rural and urban residents by assigning patients to a registered consultant and then attending to them via mobile, home visitation, or any available general hospital. The vehicle routing problem with a time window, which will be developed in the intelligent web portal, will address the patient's emergency cases when the physiological vital signs parameter obtained from the proposed wearable is either above or below the threshold level as determined remotely on the smart wearable devices at the patient location. The medical consultant's distant assessment of the patient's physiological parameters will determine whether the service is offered in-person or via phone consultation. This can drastically lower emergency cases and fatality rates associated with health care facility inaccessibility. The vehicle routing problem will be solved using a time window model and an approximation technique in order to determine the quickest path to the patient/hospital location with the least cost.

The technique will be utilized to treat stroke patients who require specialized treatments that can be supplied quickly. Through the use of a multidisciplinary team approach and an intuitive web portal, the stroke team, physiotherapist, and emergency medical system will be able to interact efficiently (EMS). These are necessary conditions for a positive prognosis in patients with acute stroke.

Motivation

Stroke patients living in rural/urban regions face substantial setbacks due to a lack of medical facilities, medical expertise, emergency response, and proximity to a hospital. Much attention has been paid to the fact that people in these areas lack access to adequate healthcare due to insufficient health service delivery mechanisms in terms of health budgets, healthcare quality, urban-rural poverty, and timely delivery of

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

medical equipment and medical experts to various communities within the Nigerian healthcare system. This solution will ease this issue to the greatest extent possible by offering a facility that will enable patients to have direct access to medical personnel.

LITERATURE REVIEW

What is a stroke?

The term "stroke" refers to the onset of a localized neurological dysfunction that lasts more than 24 hours. Additionally, it is referred to as apoplexy or cerebrovascular damage (CVA). Acute stroke is one that occurs within 24 hours of the occurrence of a preceding stroke. Acute neurological impairments are often brief and last less than 24 hours (commonly 5-20 minutes) [6], [7].
Stroke is characterized as ischemic (87%) or hemorrhagic (87%) according to its etiology (13%), [7], [8].

Ischemic stroke

Ischemic stroke is produced by the obstruction of a cerebral artery [50% by thrombotic or atherosclerotic occlusion, 25% by embolic occlusion, and 25% by micro artery occlusion, termed "lacunars stroke"].

Hemorrhagic stroke

Spontaneous rupture of blood vessels or aneurysms or trauma are the most common causes of hemorrhagic stroke.

Hemorrhagic stroke

Hypertension, cerebral amyloid angioplasty, and degenerative vascular disease are all causes of intracerebral bleeding; aneurysm rupture is what results in the second type of bleeding. There are 8-10 million Americans (3 percent of the population) who have aneurysms, although only 30,000 of them have bleeding,[21]. It is rare for there to be other sources of bleeding, and bleeding might happen for no apparent reason. Advanced age, heavy drinking, and high blood pressure are the main danger factors. Cocaine use is also linked to adolescent brain hemorrhages. 90% of intracerebral hematoma strokes occur between 30 and 90 minutes after the patient is first exposed to blood or other coagulants in the brain. A person's level of discomfort is influenced by the amount of bleeding and how long it has been taking place. Focal neurological symptoms are frequently accompanied by drowsiness and vomiting [15]. Stiffness in the neck and convulsions are rare, but headaches are probable. Coma or stupor are possible outcomes when there have been significant hemorrhages. Nearly half of patients who suffer from subarachnoid hemorrhages experience altered awareness, along with severe headache and vomiting. neurological symptoms like limb paralysis, trouble speaking, visual impairment or an unexplained headache may emerge before hemorrhage generated by an expanding aneurysm placing pressure on the surrounding tissue or by a blood leak into the subarachnoid space may occur as prodromal signs ("warning leaks").

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https://doi.org/10.37745/ijeats.13

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

Investigation of stroke

In order to effectively manage acute stroke, the results of the investigations are crucial. Brain haemorrhage and infarction can be distinguished with high accuracy using computed tomography (CT) (C.T.). However, a C.T. scan may show relatively mild alterations in the first few hours following an ischemic stroke. If a CT scan isn't decisive, using a stroke evaluation scale in conjunction with it will help clear up any confusion. The main method for examining ischemic stroke and transient ischaemic attack is magnetic resonance imaging (MRI) (TIA), [3].

Wearable devices, scheduling, and routing methods have been implemented in telemedicine systems in a variety of ways to provide remote health care to patients,[8]. The research will evaluate some prior and similar work, and it will use cellphones and wearable sensors to construct a real-time health monitoring system for remote cardiac patients. It was demonstrated that patient data could be effectively sent and monitored remotely using the system design, which entailed sending patient medical information from a body area network to a smartphone and communicating with a remote server. The author, on the other hand, discovered inconsistencies in battery life that might result in signal loss, false alarm signal transmission, and alarm time that is delayed. Furthermore, the author neglects to mention how to provide emergency health assistance to the patient.

It was also done by using commercially available medical instruments for Biomedical Signal Monitoring in a Telemedicine system for the delivery of health care to patients who were located in remote areas (EMS). HMS additionally included a proprietary standard hardware appliance for transmitting continuous real-time waveform data within a local network region (Intellivue Net), [10], [4]. Real-time transmission signal integration was required in order to maintain a continuous flow of data (HMS). Again, this piece of equipment is quite pricey and does not fall within the scope of our environmental concerns (Nigeria).Patients' heart rates were measured under three different task situations (at rest, while playing a hard video game, and while reading aloud) using a smartphone heart rate acquisition application, and the results were validated using an Android-based tool for heart rate measurement, [14].

The researchers' findings showed that the program accurately measured the subjects' heart rates (H.R.s) while performing three distinct tasks with varying H.R. intensities. In order to get accurate results, researchers used a combination of three different devices: a Motorola Droid smartphone, an electrocardiograph (ECG), and a Nonin 9560BT pulse oximeter. When testing, the participant had to hold the droid device in the left hand and place the fingertips of the left hand on the Nonin devices to collect data. Android software and smartphones have not been proven valid in gathering heart rates (H.Rs.) under varying levels of physical activity, according to the research. There is also a level of disparity in the detection of the signal when the patient moves with great integrity, [9].

Using mobile technologies to deliver healthcare support to patients with chronic diseases is critical, as most of these patients already have the equipment they need: their cell phones. They advocated in their study that the University of Chicago build a chronic health care paradigm that uses mobile health (a diabetes text messaging program) to provide patients with diabetes self-management support and team-based healthcare management, [11],[13]. The University of Chicago contacted a mobile software seller who in turn contacted the program's mobile software vendor, which was Care Smarts (mHealth Solutions). Patients enroll in self-management support via automated text messages and react to enquiries by text message to subscribe to the health support program. Afterward, a query result is dynamically received and managed by a care manager who customizes the content, provides telephone-based support for the patient, and organizes care with the supplier. It was found that the model worked extremely well, therefore it can be used in various areas of research. Implementation will be challenging in remote areas due to the low literacy rate, [13].

This was done by giving patients tablet computers and sensors to take vital signs such blood pressure monitors, weighing scales and pulse oximeters, and using the customized mobile-based home system to monitor heart failure in those patients [25]. However, system modifications were required to improve communication between the development team and the provider as part of the study. Iterative development methodologies must also be evaluated for their efficacy and cost-effectiveness.

More official way of saying something an implantable chip that includes sensors, CPU, and a communication unit has been proposed for use in wireless telemedicine. System collects and analyzes patient vital indicators to find out if there are any irregularities. As soon as irregular pulses are detected, the data is transferred to a remote server and retrieved through the Internet on a web-based interface by a physician who analyses the data and provides feedback or dispatches emergency services to the patient's location, [1]. However, the system is programmed to only send abnormal pulse measurements in an attempt to reduce the expense of using General Packet Radio Service (GPRS) for real-time telemonitoring. This may not be sufficient for the physician to conduct a proper medical inquiry because previous data is critical while examining a patient in real time.

[22] Paraphrased in a formal manner Create a Mobile Monitoring System that communicates with an Electrocardiogram (ECG) device over Bluetooth and Mobile Messaging Services (MMS/SMS). Through Bluetooth, a sensor gadget transmits ECG data and body temperature to the smartphone. The client/mobile patient's phone's application software plots the received data on the phone's screen. As long as there is a cellular network that delivers data services near both the client and the doctor, the program saves the recorded data as an image and SMS can transmit it to the doctor's phone. To receive and show data from the distant patient, a PC-based software application is created and installed on the doctor's equipment. Although it could communicate body temperature, the device was only set up to monitor in the short term.

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

On the other hand, [24], 12], discussed the creation of an emergency medical services telemedicine system using commercially available medical devices like monitor/defibrillators and accompanying software. According to their findings, the integration process for developing research prototypes in clinical trials can be sped up by leveraging commercially available devices. Adding a Web user interface streamlines the research process as well. There was, however, no consideration given to the issue of bio-signal lag time.

[3] Showed a ZigBee-based wireless health monitoring system that was both real-time and secure. Instead of security and lighting, the authors say, "ZigBee and health care applications have received less attention despite high-value added" in comparison to smart home standards. The goal of the study was to develop a safe and efficient method for transmitting medical and content-aware data from mobile patients to healthcare providers via body sensor networks and other wireless networks while also meeting the Quality of Service (quality of service) requirements.

[27] Paraphrased in a formal manner, an ultra-wideband (UWB) technological feasibility research was carried out, and a wearable pulse radar system on chip was designed to provide contactless cardiopulmonary monitoring. The wearable interface is integrated inside the patient's inner garment in their prototype. To detect the position or movement of things inside the body, ultra-wideband technology uses field disturbance sensors. An implanted system measures heart and breathing rates and transmits the information to a radio interface. The radio interface then transmits the information to a distant server over the Internet. The theoretical analysis and simulations used in the feasibility study indicated a high degree of agreement between the theoretical model and the simulation results for system-on-a-chip radar. Patients who wear sensor gadgets will have less trouble getting around thanks to the new system. The studied the use of hand-held tele-ECG and traditional ECG in rural Indian health care delivery [19]. As demonstrated by the results of a pilot research, the tele-electrocardiogram is as accurate as a conventional ECG in the distant health care setting. The writers, on the other hand, emphasized the significance of safeguarding user privacy, [13].

We implemented a telemedicine system that uses mobile internet communications to monitor patients with cardiovascular disease (CVD) and diabetes. It was discovered that implementing a continuous cardiac monitoring system could help people with diabetes type 1 and 2 as well as psoriasis, shoulder surgery, and COPD. In order to create a body area network (BAN) using Bluetooth wireless communication, the system includes sensor nodes that patients can wear. These nodes monitor vital signs and send them to a mobile device (PDA). The PDA is linked to a remote server or database utilizing 3G/EDGE mobile internet. The PDA user application uses C# to upload the data to a tiny database on the PDA and a spreadsheet database for analysis and evaluation. A remote clinician logs onto a web browser and downloads the spreadsheet from the server to examine the spreadsheet interface.

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https://doi.org/10.37745/ijeats.13

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

Studies by [11] employing remote monitoring to improve the health of patients with heart failure verified the effectiveness and utility of R.M. in biomedical engineering. One hundred and fifty heart failure patients were examined as part of the study.

METHODOLOGY

Wearable sensors and high-tech information and communication technology approaches are used in the created healthcare service delivery mechanism for patients with cardiovascular disease in rural and urban areas. Real-time detection of underlying heart issues helps people recovering from a stroke avoid potential endemics and aids rehabilitation. To validate the design and the potential of health care delivery during the occurrence and absence of stroke endemics, the created health service delivery mechanism has a time window and is compatible with various wearable sensors.

Wearable sensors attached to the patient's vest will collect medical data such heartbeats, blood pressure, cardiac electrical activity, body and skin temperature, blood oxygenation, body weight, and patient motion using the patient's own body information. Detecting disorders like hypotension, hypertension, and hyperthermia that lead to strokes is made easier with the use of these cardiac parameters The use of an alarm system that has a higher and lower threshold The values in the model are based on the vital sign parameter's standard threshold measurement, which was encoded into the component designs. The patient's rate of movement activity will be used to recharge the wearable device's battery source.

System Architecture

The transmitting section, the processing unit, and the receiving section make up the system architecture. Biological sensors on the transmitting end collect biopotential signals from the patient's body and transmit them to a wearable vest that collects medical data about the patient. A wireless Wi-Fi network in figure 1.0 delivers real-time data from a patient's wearable jacket to the second stage of the system via this tier. These signals are sent to the processing system because they are raw and unfiltered. Arduino (a microcontroller variation based on the atmega32) and Raspberry Pi make up the second step. Arduino Software, often known as the Integrated Development Environment (IDE), is used to program the Arduino UNO microcontroller. This workspace allows the sensors to be coded and interfaced. After the sensors have been coded, the program files are created. These files are then stored and sent to the Raspberry Pi. Every bit of data from the Arduino UNO is gathered by the Raspberry Pi and then displayed on a Web page. Web technologies such as Apache2 – a web server, PHP (Pre-Hypertext Programme) – an internet server scripting language, MariaDB (Relational Database Management System) and HTML (Hypertext Markup Language) have been used in this design to make the intelligent web system design more easily adopted. A particular URL will be used to display all of the patient's health-related data collected online.

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https://doi.org/10.37745/ijeats.13

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

Medical professionals and physiotherapists can see them on mobile devices including laptops, cellphones, or desktop computers.

First, sensors are attached to nodes or placed on the patient's body via wearable devices. To get vital sign parameters or information from wearable sensors, the second tier utilizes an Android-based smartphone. To access the web portal from an Android smartphone, use GPRS, 3G, or another Wi-Fi network. To find out where people who are being monitored or who are in a critical state are, the smartphone's GPS app connects with a vehicle routing algorithm with a time window incorporated in the intelligent web portal, which then uses the Raspberry Pi+'s uploaded health si-Fi to pinpoint their location. Web portal is an intelligent collection of data from wearable sensors, such as the Raspberry Pi, that can be used to identify stroke patients. This data is displayed on the web interface, also known as the doctor's interface, together with the patient's location and personal information. This final level incorporates a vehicle routing issue with a time window algorithm into the smart web site. In order to properly schedule critically ill patients, the final stage must be completed (emergency). Using a time window approach, the vehicle routing problem can be used to determine the quickest route to the patient's location and the vehicle's capacity to get them there, as well as the closest teaching hospital for further treatment.

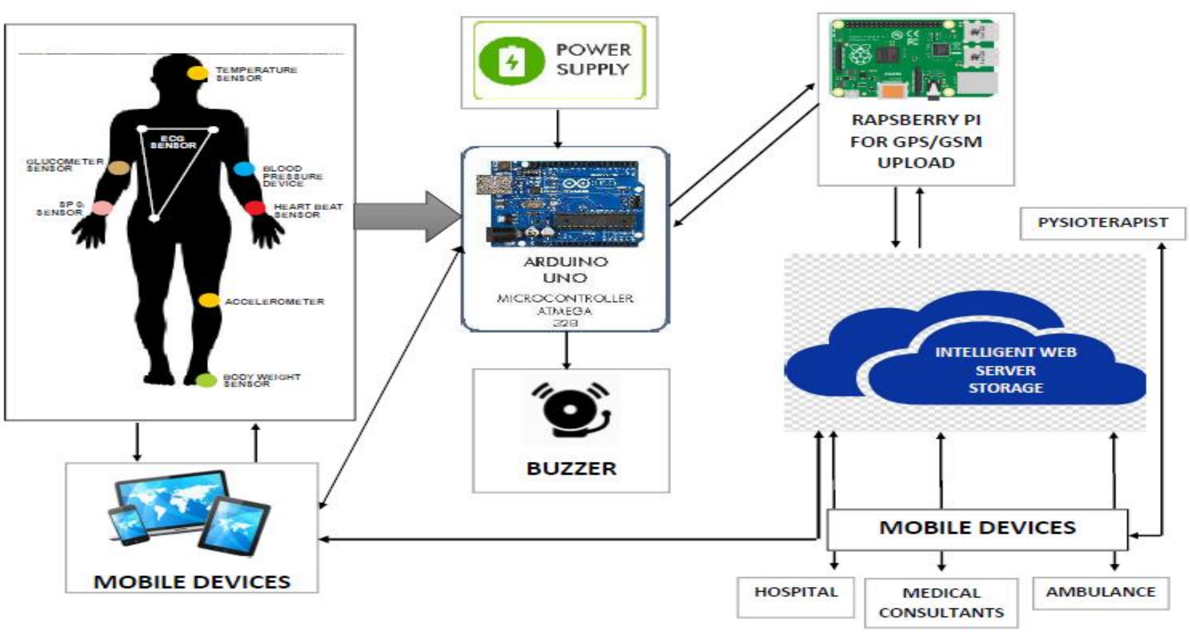

Figure 1.0: System Architecture of the System

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https://doi.org/10.37745/ijeats.13

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

System Design

It is possible to construct a system for health wearables by integrating mechanical, electrical, and electronic components as follows: Battery (12V), Voltage Regulator LM7805 (Microcontroller), ECG/Temperature/Buck Converter Pulse Sensor, Comparator (LM358), Transistor BC547 (Microcontroller), Light Emitting Diodes (LED), Buzzer and web portal. The system's hardware includes a microprocessor, an ECG sensor, a buck converter, a pulse sensor, a temperature sensor, and a buzzer, among other things. An in-system programmer and relays were used to operate the appliances. The design was done on a breadboard. An integrated circuit module, such as a sensor, is housed inside the design's jacket as the sensor unit. Figures 2.0 and 3.0 illustrate this. A 5 volt DC power supply powers this integrated circuit. Upon powering on the device, the LED intro sequence begins, followed by an indication that the gadget has been powered on. The connection LED lets you know if your device is connected to the Wi-Fi network you've selected. The ECG sensor measures the electrical activity of the heart after a successful connection. It's saved in the Microprocessor's EEPROM together with the patient's temperature and pulse. The red LED indicates when the reading is in progress and when it is complete during the preceding process. One thing to keep in mind is that the device won't begin reading until the ECG leads are connected to it. The gadget uploads the stored values to the cloud after the reading and storing processes are complete. The success or failure of the upload is indicated by the upload LED. This is how the microcontroller will be set up. It was necessary to use a 12volt battery as a power supply. It is necessary to utilize a voltage regulator to moderate the 12 V power supply so that the microcontroller and other digital integrated circuits can operate at 5 V. Figure 1 depicts the design's block diagram. Proteus, a circuit design suite, was used to create the initial device circuit schematic. A breadboard prototype was used to evaluate the circuit's practicality before a printed circuit board (PCB) was designed and etched for the final product. Afterwards, an appropriate acrylic glass container was created for the device when the foregoing process had been completed and the necessary results had been obtained; because the microprocessor utilized was a 3.3V device all components chosen had to be 3.3V compliant. The esp32's Vin and GND pins are connected to the lipo battery's positive and negative terminals. LO+ and L.O- are connected to the pins 3V3, GND, 39, 12, and 14 on the ECG, respectively. The ECG has no inputs. With the pulse sensor, the pins 3V3, GND, and Out are all connected to the same voltage. Figure 4.0 depicts the system's complete circuit diagram.

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https://doi.org/10.37745/ijeats.13

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

Figure 3.0 shows the wearable system with the jacket.

Figure 2.0 shows the external view of the wearable system.

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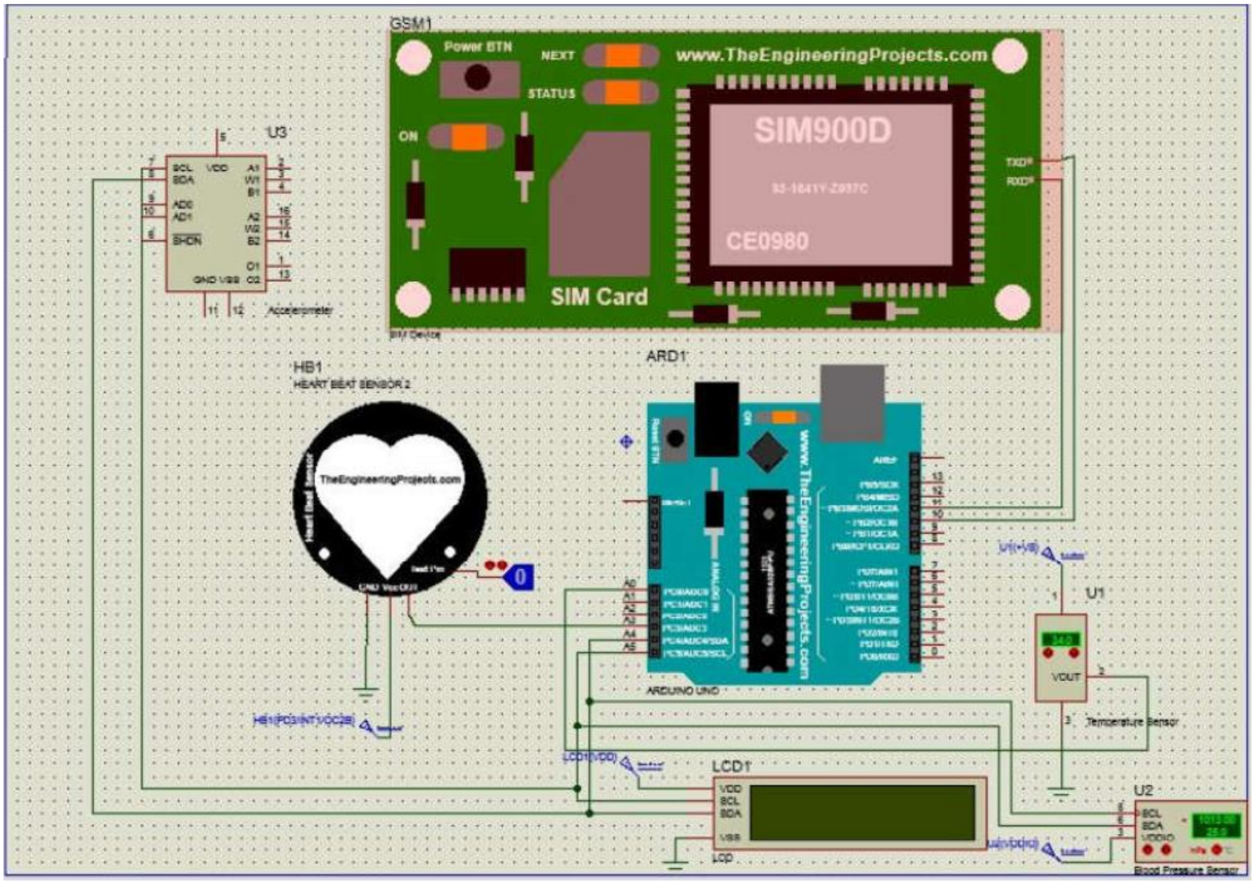

Figure 4.0: Shows the complete circuit diagram of the system.

RESULTS

The system has an Arduino Uno built in to handle the sensor signals and keeps track of the patient's health over time. The processed data is then sent to the Raspberry pi through SIM 900 and uploaded to the cloud. The system included a patient and medical consultant interface for registering and storing intelligent cloud storage records on the web. Patients registered for their initial consultation and received the newly created wearable devices. With this, patients can be monitored remotely via the intelligent web portal to avoid being exposed to covid-19 and to receive rapid treatment in the event of an emergency. The sensors will begin wirelessly reading and transmitting data on temperature, blood pressure, heart rate, oxygen saturation, and electrocardiogram (ECG) to the intelligent online cloud in the coming weeks. The patient's

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profile contains a summary of their vital signs. The nearest ambulatory hospital receives an SMS alert in an emergency, and the vehicle routing system determines the fastest route to the patient's location based on that information. In order to process the sensor signals, the system includes an Arduino Uno, which is integrated into the device. The Arduino board used SIM 900 to send the processed data to the Raspberry pi, which subsequently uploaded it to the cloud. In order to register and store the intelligent web cloud storage records, the system included an interface for patients and medical advisors to the patient's file. Patients were given the newly created wearable devices as soon as they registered during their initial session. With remote monitoring from the intelligent web site, it will be possible to keep covid-19 out of the hands of patients. The sensors will begin wirelessly reading and transmitting data on temperature, blood pressure, heart rate, oxygen saturation, and electrocardiogram (ECG) to the intelligent online cloud in the near future. a summary of the patient's vitals signs is kept in the patient's record The nearest ambulatory hospital receives an SMS alert in an emergency, and the vehicle routing system determines the fastest route to the patient's location based on that information.

CONCLUSION

In order to process the sensor signals, the system includes an Arduino Uno, which is integrated into the device. Sim 900 on Arduino board transmits filtered data, which Raspberry pi pushes out to Amazon Web Services through the cloud. Using a patient and medical consultant interface, the cloud storage records might be registered and stored on the system. After completing registration and having their initial appointment, patients were given the custom-designed wearable devices. This will allow for remote patient monitoring via the intelligent web interface, hence reducing the risk of exposure to covid-19 and allowing for more rapid emergence therapy. The sensors will begin wirelessly reading and transmitting data on temperature, blood pressure, heart rate, oxygen saturation, and electrocardiogram (ECG) to the intelligent online cloud in the coming weeks. There is a summary of the vital sign parameter in the patient's profile. The nearest ambulatory hospital receives an SMS notice in an emergency, and the vehicle routing system determines the fastest path to the patient's location.

In order to process the sensor signals, the system has an Arduino Uno integrated in. As soon as the data had been analyzed, it was sent out over SIM 900 to the Arduino board, and subsequently to Amazon S3. The system included a patient and medical consultant interface for registering and storing intelligent web cloud storage records. When the patients registered for their first appointment, they received the newly created wearable devices. By using the intelligent web portal, remote monitoring will be possible to keep patients safe from covid-19 exposure. The sensors will begin wirelessly reading and transmitting data on temperature, blood pressure, heart rate, oxygen saturation, and electrocardiogram (ECG) to the intelligent web cloud in the future. The patient's profile contains a summary of the vital signs parameter's value. The

Vol. 9, No.2, pp.38-52, 2021

ISSN 20535783(Print)

ISSN 20535791(online)

nearest ambulatory hospital receives an SMS notice in an emergency, and the vehicle routing system determines the fastest path to the patient's location.

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