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Medical Glove for Doctors

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Abstract **- Health always has been primary need of every human being. The growing population and the storing every records of every patients is becoming hectic and storage problem to every Hospitals. In these last recent years of development in medical technologies of sensors and embedded system.**

We proposed a medical diagnosis system to read patients body temperature, blood pressure, ECG and heart beat which all the sensors will be set up on the glove and which will be wore by the doctors of every hospital around the world, and with processed patient id for further data access for the organisation or the medical company. And the microcontroller will send the patient data to the hospital database and moreover data inquiry to government and World Health Organisation to process data with intelligence

This glove is be washable and reusable with provided sensors safety and necessary covering, and even sensors can be easily replaceable from the wearable glove, through this technology doctor and can access the old data of the patient that is stored in the hospital database. And look into the patient diagnosed data, doctor can easily gets idea about what disease he/she has previously met with.

Keywords— Medical glove, medical technology, wearable technology, medical automation, patient monitoring, medical data collection for AI technology, thermal imaging, Artificial intelligence.

I. INTRODUCTION

The Medical Glove is a device proposed for doctors, which is based on Internet of Things architecture, in this era of automation and technology. Doctors are still finding difficulty in storing and maintaining data of every single patients. Still the old methods of storing records and papers is a hectic job to the Medical organization. And even checking patient body temperature, beat per minute, blood pressure and electro-cardiogram is a lengthy job and storing the data and keeping it in a safe manner becomes difficult to both patients and the doctors. And these days sometimes disease recognition is a difficult task, through Medicore IRIS-XP Digital Infrared Imaging system the disease recognition like cancer and body pain recognition becomes easy task. The Medicore IRIS-XP will be connected with Medical Glove through Wi-Fi.

The Medical Glove consists of sensors which is placed on the finger's tip of the glove. Many sensor technologies used in industry can be applied in medicine, and in the future, as unique sensors and sensor dependent microelectromechanical systems are designed and tested, non-medical industries will adapt them for industrial applications. Within the medical world there is a broadening intersection between information technology and biotechnology, and increasingly the role of sensors, signal transducers. As for the size that can we placed on the glove, it will only consist of three primary sensors. The LM35 sensor for body temperature monitoring, the pulse sensor for heat beat monitoring and the ECG sensor on the tip of the fingers. And the Medicore IRIS-XP which will be in the clinic of the doctor and even interfaced with the Glove's screen, to easily view the data and recognize the disease on the doctors hand, it can further store with the patient's id for easy data storage and digital report can also be send through a social media platforms or through emails.

Flow through the second phase this glove will get smarter and smarter day by day with the help of Artificial Intelligence. The data of the patient will be process through certain algorithm with the help of the doctors using previous data and diseases they have claimed through it, through Machine Learning the glove with get more accurate results and will provide better solution to the doctors. The Medical Glove will also suggest the doctor which medicine does a patient should take, this glove will bridge a gap between the machine and doctors around the world for a proper treatment, if the doctor isn't able to take the case he can connect to the other doctor and solve the disease.

The IoT has come a long way in recent years and is well integrated within multiple industries, including the healthcare space. The continued implementation of IoT within healthcare will lead to a drastic increase in productivity and analysis of data. Advancements in technology in regard to medical devices will improve patient outcomes with better analytics, and Global Data believes the IoT will expedite this process.

This paper demonstrates about the Medical Glove IoT device which is specially designed for doctors for many purposes such as disease recognition through infrared thermal image processing, and to diagnosed the patient data and to store it to the cloud server or the hospital database, through the medical data certain Artificial Intelligence algorithm will be processed based on previous data of patient and the disease will get a better accuracy through the similarity over the prior patient with the same or similar case.

II. RELATED WORK

Till todays date there are many innovative technologies developing right now in this world.

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Medical Intelligence is the most important factor. There are many researches is going into the process monitoring of health condition at home is important for an effective scheme for early diagnosis, treatment, and prevention of lifestyle-related diseases such as adiposis, diabetes and cardiovascular diseases. While many commercially available devices for home health care monitoring are widely used, those are cumbersome in terms of self-attachment of biological sensors and self-operation of them.

Dimitrov et al Internet of Things (IoT) and appropriated registering expect a crucial activity in the present Tele-watching prosperity system. This structure screens patient's physiological parameters through arrangement of body sensors' data using Arduino Lily pad board. The patient's prosperity card appeared on a site page where authorities and patients can get to and bestow each other without physical closeness [1].

Ayush Bansal, Sunil Kumar, Anurag Bajpai, Vijay N. Tiwari, Mithun Nayak, Shankar Venkatesan, Rangavittal Narayanan focuses on development of a system which is capable of detecting critical cardiac events. Using an advanced remote monitoring system to detect symptoms which lead to fatal cardiac events [2].

Muthuraman Thangaraj Pichaiah Punitha Ponmalar Subramanian Anuradha .”Digital hospital” term is introduced for hospital management. It enables automatic electronic medical records in standard. Also discusses with the implemented real world scenario of smart autonomous hospital management with IOT [3].

Soumya Kanti Datta used the approach e-health monitoring which is highly suitable for the patients with unstable physiologic regulatory systems and high risk of developing life-threatening condition. They have categorised the architecture into three layers based on the functionality of the components being used. First layer is Perception layer at the bottom consist of sensors which collect data. Then. Middleware and APIs layer is the pivotal layer consisting of various APIs(application programming interfaces). The third layer is e-health application and service layer is a terminal layer offering outsourcing services for the monitored data [4].

Tyagi et al. Explored the role of IoT in healthcare and studied its technical aspects to make it reality and identify the opportunities for which they propose a cloud based conceptual framework in which the patients’ medical data and information can be securely transferred, with the permission of patient and their family by building a network among patient, hospital, doctors, Labs etc. The primary reason behind this is to relieve patient from the expensive clinical aid, overcome the shortage of doctors and therefore providing enhanced care and service to patients [5].

Sahoo et al. Studied the healthcare management system and about the large amount of patient data that is generated from various reports. They further analyzed the health parameters to predict the future health conditions of the patient or the said subject. They use a cloud based big data analytic platform to achieve the same using the means of probability [6].

Xu et al. Presented a data model to record and use the IoT data. They designed and developed a resource-based Ubiquitous Data accessing method to collect and publish IoT data globally to so that it can be accessed anywhere, anytime. They also present an emergency medical service based on IoT and how to collect and use the IoT data on different platforms [7].

Dwivedi et al. Developed a framework in order to secure the clinical information that has to be transmitted over the internet for Electronic Patient Record (EPR) systems in which they propose a multi-layered healthcare information system framework which is a combination of Public Key Infrastructure, Smartcard and Biometrics technologies [8].

S. Lorenz et al It urges from beginning to end watching screen through three phases. At first, the consistent prosperity parameters are evaluated through wearable sensors and transmitted to a propelled cell which shows the patient prosperity status in graphical interface. Likewise, this structure gives a data to relative and master through web interface for extra checking [9].

Mohammad M. Masud, Mohamed Adel Serhani, and Alramzana Nujum Navaz had given the measurement of ECG signals at various intervals and at different situations. They have considered energy aware, limited computing resources and lose network continuity challenges .For these challenges; mathematical model has been developed to execute each task sequentially. There are three approaches designed to work out the process .One is mobile based monitoring approach, data mining and third is machine learning approach [10].

III. SYSTEM AND OVERVIEW

A. Block Digram

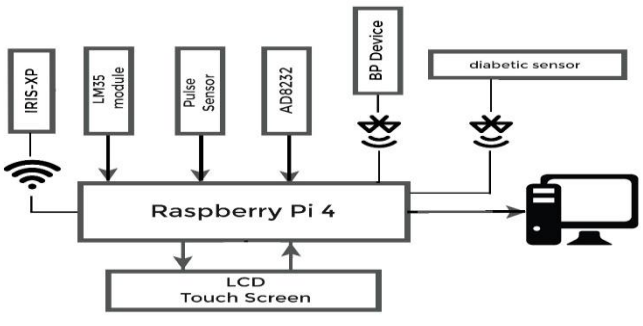

Fig 1: Block diagram of system

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The Fig 1 shows the block diagram for the Medical Gloves, which uses raspberry pi as it both microcontroller and microprocessor to control the sensor and process the reading on the touch screen, on which the temperature sensor, pulse sensor, and AD8232 will be on the glove as shown in the Fig 2. The Medicore thermal imaging system IRIS-XP will be connected to the glove through WiFi

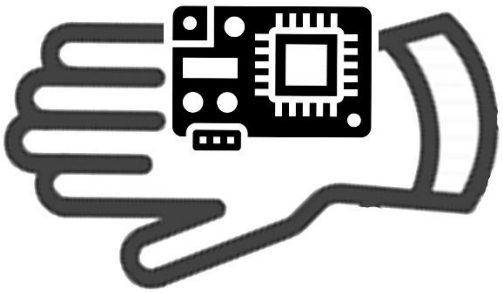

Fig 2: Medical Glove

Fig 2 shows the whole architecture that will be om the glove which is to be wear by the doctor.

B. Objectives

- To develop a wearable IoT system for easy temperature and blood pressure monitoring.
- To store the patient's data with patient's id in the hospital data base to the cloud server.
- And to develop an app for hospital to maintain the patient's data easily.
- Through thermal imaging we can monitor deadly diseases like cancer.
- It will reduce the paper work of hospitals as well as staffs.
- Patient's record will be easier to maintain.

C. Methodology

This is design based on raspberry pi microprocessor Medical Glove for the doctors to read the patient body temperature, heart beat(pulse), random blood sugar, blood pressure and able to recognize deathly diseases through thermal imaging with the touch screen display on the gloves. This product can be used in every hospitals and clinics. In the recent years wireless technology has increasing for the need of upholding various sectors. In these recent years IoT grasped the most of industrial area specially automation and control. Biomedical is one of recent trend to provide better health care. Not only in hospitals but also the personal health caring facilities are opened by the IoT technology.

D. Component Used

1. Raspberry Pi 4

Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior-generation Raspberry Pi 3 Model B+, while retaining backwards compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems.

Fig 3: Raspberry Pi 4

This product's key features include a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 4GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability (via a separate PoE HAT add-on).

2. Touch Screen Module (3.5 inch)

Designed for Raspberry Pi, an ideal alternative solution for HDMI monitor. Supports any revision of Raspberry Pi (directly-pluggable). Driver provided (works with custom Raspbian directly). 320×480 resolution, better display. Convenient Men-Machine interface for Raspberry Pi, combined with the portable power, DIY anywhere anytime. Supports Raspbian system, enables your system to: Take photos by touching (up to 17 camera modes). Support software keyboard (system interaction without keyboard/mouse).

Fig 4: LCD Touch screen Module (3.5 inch)

- LCD Type: TFT
- LCD Interface: SPI
- Touch Screen Type: Resistive
- Touch Screen Controller: XPT2046
- Colours: 65536
- Backlight: LED
- Resolution: 320*480 (Pixel)
- Aspect Ratio: 8:5

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3. LM-35 (Temperature Sensor)

LM35 is a temperature measuring device having an analog output voltage proportional to the temperature. It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry. The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases. E.g. 250 mV means 25°C. It is a 3-terminal sensor used to measure surrounding temperature ranging from -55 °C to 150 °C. LM35 gives temperature output which is more precise than thermistor output.

Fig 5: LM-35 Temperature sensor

4. Pulse Sensor

The working of the **Pulse/Heart beat sensor** is very simple. The sensor has two sides, on one side the LED is placed along with an ambient light sensor and on the other side we have some circuitry. This circuitry is responsible for the amplification and noise cancellation work. The LED on the front side of the sensor is placed over a vein in our human body. This can either be your Finger tip or you ear tips, but it should be placed directly on top of a vein.

Fig 6: Pulse Sensor

5. AD8232

The working of the **Pulse/Heart beat sensor** is very simple. The sensor has two sides, on one side the LED is placed along with an ambient light sensor and on the other side we have some circuitry. This circuitry is responsible for the amplification and noise cancellation work. The LED on the front side of the sensor is placed over a vein in our human body. This can either be your Finger tip or you ear tips, but it should be placed directly on top of a vein.

Fig no. 3.7 AD8232 (ECG Sensor)

6. BP Sensor

Blood pressure is the force of blood against the walls of arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats). The measurement is written one above or before the other, with the systolic number on top and the diastolic number on the bottom. For example, a blood pressure measurement of 120/80 mmHg (millimeters of mercury) is expressed verbally as “120 over 80.”

Fig 7: BP Sensor

7. Medi-core IRIS-XP

Fig 8: IRIS-XP

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It is a medical infrared thermograph system to visualize the pain in colour image by detecting the infrared ray from the human body. Features Full Digital Camera Link method for the medical images. Saving the real time video and real temperature of patients. Possible to take the images in a narrow distance easily with the Digital Zoom function. PACS / EMR Compatible. High Resolution Colour Provide the high-resolution image to detect the difference of temperature under 0.07℃.

D) Results

Fig 9: setup of the system

Fig 9 shows the working of the basic prototype of medical glove.

Fig 10: Working of Device

Fig 10 shows the Output on LCD of pulse sensor and temperature sensor for a time being further work will process with LCD touch screen and the software for the Medical glove

IV CONCLUSION AND FUTURE WORK

This paper contains about the Medical Glove that will help the doctors globally, in this paper author has proposed about the basic version of this project, through which doctors can diagnosed the patient, and even store the patient data will the help of cloud servers. The doctors can easily recognize the disease through thermal imaging camera and easily detect, the body pain area can detect easily and treated it as per the procedure.

This work will continue to develop with the user interface and the Machine Learning technology to process with the older data of the patient for accurate treatment process suggestion and the medicine prescription to the normal physician and the development of the user interface which will be friendly with doctors, to login with doctor's id and password, they ll get the patient id and the old data of the patient with no time, and they will able to diagnosed patient quickly.

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