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Health Monitoring System using Microcontroller

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Abstract: Due to the emergence of the new corona virus, health care is now of paramount relevance in every country. In this new era of technology, man has become a working machine that works like a robot 24 hours a day, seven days a week to acquire two meals. In this fast-paced world, he has forgotten to focus on the most important aspect of life: his health. Thus, one of the most essential uses of IoT is the health monitoring system. In India, about a quarter of the population dies as a result of a broken health-care system, in which doctors see patients in the morning, evening, or alternate shifts in most hospitals. What happens if a patient's health becomes critical in the meantime or if a doctor is unavailable to treat them? The solution is that a patient may lose his or her life. To avert this critical circumstance, we propose a practical embedded system device that continuously checks the health of patients. The pulse rate, vital signs, and saline liquid level of the patient are all monitored by this device (if any). Knowledge and communication technologies aid in the development of a digital revolution. For integrating various physical devices with networks, an IOT area unit has been identified.

Keywords: Healthcare, Microcontroller, Arduino, Blood pressure sensor, Wifi module

I. INTRODUCTION

Automation is a significant concept in IoT and Cloud computing since it automates numerous processes such as monitoring without the need for supervision. Infrastructure as a Service, Platform as a Service, and Package as a Service are the three main cloud services. Amazon Internet Service, Google App Engine, HP Cloud Application Delivery, and Microsoft Windows Azure are just a few of the services they have access to. When researching IoT applications, we discovered that we could utilise a variety of sensors to scan patients' health information and save it in the cloud. The system is used in this research to monitor the health of humans using less power.

This system is used to continually measure the values of critical physiological parameters in patients such as blood pressure, body temperature, ECG, EMG, heart rate, and so on. Using bio-sensors, this device detects the patient's numerous parameters. A biosensor is a chemical sensing device that combines a biologically generated recognition entity with a transducer to allow for the quantitative development of a complex biochemical parameter. The primary goal of a patient monitoring system is to standardise everything from medical terminology to networking protocols so that medical records may be kept electronically and communicated to doctors promptly.

Patient attention A system is a method in which a doctor continuously monitors one individual in a very remote location, in way over one parameter at a time. The soundness of the human heart is shown by the heartbeat. It aids in determining the state of a patient's circulatory system.The muscles receive oxygen-rich blood from the human heart. Except for tissues, it transports cell waste. Pulse rate varies in response to the need for muscles to expel carbonic acid gas and absorb element changes that occur during toil or sleep. This heart beat monitoring device allows the United States of America to calculate stomach beats per minute and compare them to normal heart beats; this information will only be used to track heart illness. Body temperature is also a common indicator of overall health.

Traditional organic structure temperature is (98.6 ° F 0.7°F), and it varies according on the person's activities as well as the location of measurement. When a person becomes too hot, the blood vessels in their skin expand to transport the excess heat to the skin's surface. As a result of this, the person begins to sweat. The sweat then evaporates, allowing the organic structure to chill down. The SHM method entails observing a system over time while subjecting it to sporadically sampled dynamic response measurements from a variety of sensors, extracting damage-sensitive options from these measurements, and analyzing those options using applied math to determine the state of system health. The output of this strategy for future SHM is periodically updated information about the structure's flexibility to fulfil its intended function considering the inevitable ageing and degradation resulting from operating. For better treatment, regular monitoring of medicine parameters is critical. Concern for human health is more important than ever before in this era of contaminated environments. When someone is sick or dead, everything becomes trashy. People nowadays spend a lot of money to appear healthy. In the vast majority of cases, it is discovered that it is too late to receive adequate medical care. As a result of the mechanism, an unforeseen incident occurs.

Because pulse rate, blood pressure, and vital signs are the most important notable parameters, an inexpensive instrument to measure them is beneficial to human health.

Furthermore, the device could be useful for monitoring the condition of important patients from afar. The rest of the paper goes over existing methodologies, our system model, system development, and finally system performance measurement. IoT in e-health care has smartly emerged, allowing patients and clinicians to obtain health status information on the flow without having to visit hospitals. Several improved sensors in current technologies appear to be extremely promising for health-care applications. One of the advanced technologies for developing e-health care is wireless body space device networks. This technology consists of several sensors that, once attached to an organic structure, read and write the patient's health data.

II. LITERATURE REVIEW

A. *Theoretical Background*

Many researchers have discussed the various IOT applications and highlighted certain key parameters and functionalities for each. [1] They primarily focused on the roles and characteristics of IOT in healthcare. The technologies that enable IoT in healthcare were also explored.

They even propose how cloud can be employed in the healthcare industry in this study.

Many scholars have talked on how to create an ad-hoc, extendable patient monitoring system. [2] They used low-cost sensors as well as existing IoT technology as a communication platform.

They created this monitoring system in order to assist the elderly. Their system is primarily designed to notify a patient's guardian or a physician if an elderly person requires medical assistance. They also ran performance tests to see if the system could handle many requests at once and if the number of sensors could be increased. [3]

Some researchers have developed a robust and sophisticated health monitoring system that uses IOT to monitor the patient's health and collect information such as blood pressure, heartbeat rate, and ECG. Rather than seeing the doctor in person, the patient or users might email this data to the doctor.

They use an Intel Galileo board from the second generation. This is a single board based on Intel Quark. It is an Arduino-certified embedded board. This is an embedded system since it can function as both hardware and software and is pin compatible. This Intel Galileo board features a Linux operating system and SD card capabilities. The information is sent to the database server. [4] This information can then be accessible from anywhere in the world.

For remote monitoring, research scholars implemented two IOT-based designs. These two designs were created using two separate wireless technologies. The first uses Wi-Fi, while the second uses Zig-bee. [5] Their purpose is to determine the benefits and drawbacks of these systems. The zig-bee system has a diverse range of sensor nodes. The data is read from several medical sensors and processed before being sent to the server through zig-bee. The bio-medical signals were accessible by the Wi-Fi sensor system, which updated the server's database. The servers collect data and update the database in both test instances. For remote access, this database can be accessed and shown in a web page.[6]

B. *Patient Monitoring System*

Continuous or repeated observations or measurements of a patient's physiological parameters and the function of life support equipment for the aim of guiding management decisions, such as when to undertake therapeutic interventions and how effective they are.

A patient monitor not only notifies doctors and medical personnel of potentially life-threatening situations, but it also provides physiologic input data for controlling directly connected life-support devices. [7]

1) Patients with physiologic regulation systems that are unstable are given PMS. A patient whose respiratory system has been repressed due to a drug overdose or anesthetic.
2) Patients suspected of having a life-threatening ailment. It may deliver notifications and ideas when stress levels indications are rising before humans can see them. A patient with signs of an acute myocardial infarction, for example (heart attack).
3) Patients who are at a high risk of having a life-threatening illness. Patients recovering from open-heart surgery, for example, or a premature child whose heart and lungs have not fully matured.
4) Patients who are in a life-threatening physiological state. Patients with multiple trauma or septic shock, for example.
5) Toxic compounds such as mercury and lead may be detected and alerted by smart biosensors.

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III. PROPOSED DESIGN

Patients, guardians, physicians, medical laboratories, clinics and hospitals, attendants, nurses, and governmental authorities were the main players. If health-care information is required for validation and authorization of any legal authority or auditing, the general public authorities are involved. The display will be used in a variety of ways, including wearables, jewelry, and beneath the shoes for viewing the user's health in small type. This may be a whole system. Occasionally, the gadget will be placed within the form itself to collect data. A method of collecting the patient's information and storing it in the cloud using IOT. [8]

Because the health status can be monitored indefinitely, the tiny print area was captured and kept in sync. We can also establish timers to collect data at the exact moment that our need is met. If we select an hour as a time limit, the IOT device can check for data every hour and store the information.

Cloud computing is known for its logical information storage of digital data. Multiple buyers will receive this information at the same time. The holding company is in charge of the physical environment. Cloud service providers are responsible for ensuring that information is available at all times and from any location. The physical environment should be in excellent working order. The hosting company is also responsible for the information security. This information will be read by the users at any moment. The patient is monitored in this article using IoT devices with various sensors, and their information is stored in the cloud. Except for the patient, each actor is issued a single RFID-enabled positive identity. The information is tracked by the continuous monitoring system, but it is not displayed on the monitor until the verified actor signs in using RFID positive identification. [9] When the doctor enters the patient's information, the monitor displays the patient's details such as temperature, pressure, and cardiac scan. The information also contains the doctor's information, such as name and login information. The information also includes the time the doctor leaves the region. This allows the United States to determine how long a doctor spent with a patient.

IV. METHODOLOGY

To put in place an international health-care surveillance system. These sensors were designed and interfaced to the ATmega16 microcontroller to monitor medical characteristics like as pressure, pulse, and temperature. This microcontroller includes an ADC that converts analogue signals from sensors to digital signals. Wearable sensors such as pulse monitors and pedometers are increasingly popular. Many products are already on the market, such as Vivo metrics' Life shirt, Body Media's Body Watching System, and Nike's Apple iPod Sports Kit, which allows for personal feedback monitoring of performance during activity periods. The heartbeat detector is a simple way to monitor how well your heart is working. The flow of blood through Finger is monitored by this detector. The amount of blood in the finger fluctuates over time as the heart forces blood through the blood arteries within it.

When a finger is placed on the heart beat detector, a digital output of the heart beat is displayed. It has a brilliant red crystal rectifier that works well and a light weight detector. Because the most light should pass unfold in the finger and be recognised by the detector, the crystal rectifier must be extremely bright. The finger becomes somewhat more opaque as the centre pumps a pulse of blood through the blood arteries, allowing less light to reach the sensors. The detector signal changes with each heartbeat. This change is translated into an electrical pulse.

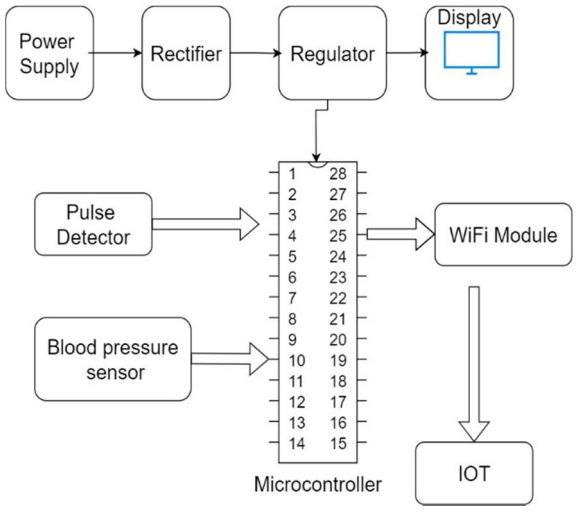

Fig. 1. Block Diagram

This digital output will be connected to a microcontroller, which will display the BPM rate. An electronic device that outputs a +5V logic level signal amplifies and triggers this signal. A light emitting diode that blinks with each heartbeat also indicates the output. The planned approach has a significant advantage: including ambient sensors that collect context data can aid in medical knowledge analysis. When a patient is participating in sports, medical measures such as heart rate and oxygen saturation must be taken regardless of whether the patient is sleeping or not. It's estimated that seventy percent of all illnesses might be avoided with proper screening.

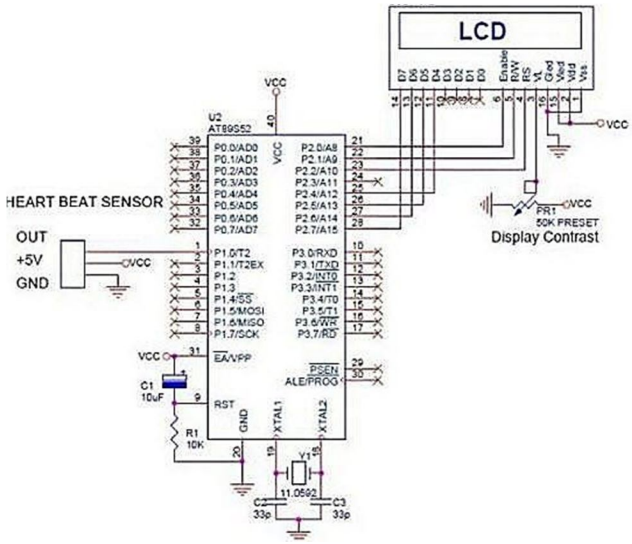

Fig. 2. Pin Diagram for the proposed system

If metrics were implemented, prices for treatments and pharmaceuticals may fall dramatically. Temperature sensors, humidity sensors, and, in the event of an emergency, smoke detector alert signals are among the environmental sensors. It is critical to include specific conditions sensors such as smoke detectors so that the attending medical professional can explain the acceptable course of action.

A. Components and modules

Arduino Uno is a microcontroller board that uses the ATmega328P processor. There are fourteen digital input/output pins (half of which are utilised as PWM outputs), six analogue inputs, a sixteen megacycle quartz, a USB connection, an influence jack, an ICSP header, and a push. It comes with everything you need to get started with the microcontroller; simply plug it into a laptop via USB or power it with an AC-to-DC adapter or battery.

Fig. 3. Arduino ATmega328P

The module is used to determine how a laptop and a GSMGPRS system communicate. In most countries, the global System for Mobile Communication (GSM) is an associate degree design used for mobile communication. The Global Packet Radio Service (GPRS) is a GSM expansion that allows for faster data transmission rates. GSM/GPRS module is made up of GSM/GPRS electrical equipment that is mounted on the side of a laptop and provides circuit and communication interfaces (such as RS-232, USB, and so on). GSM/GPRS electronic equipment is a class of wireless electronic equipment products designed to connect a laptop to a GSM or GPRS network. To communicate with the network, it requires a SIM (Subscriber Identity Module) card, similar to mobile phones.

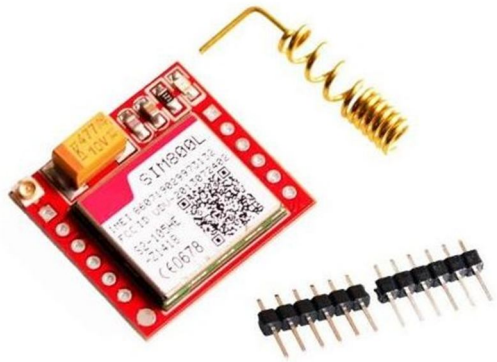

Fig. 4. GSM/GPRS module

They also require the IMEI (International Mobile Instrumentation Identity) variation of mobile phones for identification. The following operations will be carried out using GSM/GPRS electronic equipment: one. SMS can be received, sent, or deleted.
A temperature sensor element is a gadget that is designed to measure the hotness or coolness of a certain object. The LM35 could be a high-precision IC temperature sensor, having an output proportional to the temperature (in degrees Celsius). The temperature is measured more precisely with the LM35 than with a semiconductor. It also has a low self- heating capacity and does not produce zero heat. Temperature rise of 1 degree Celsius in steady air.

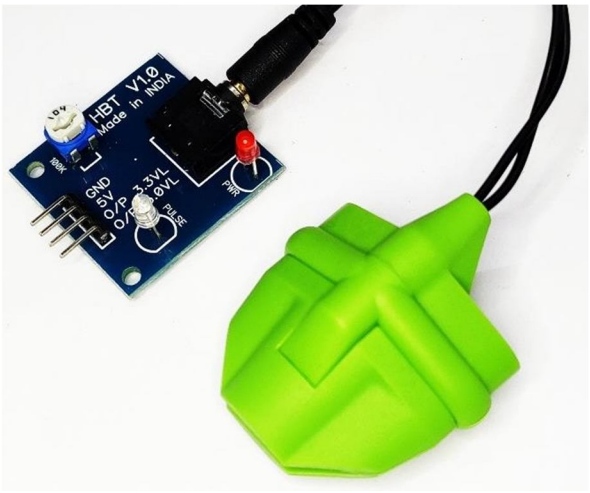

Fig. 5. Heartbeat sensor

V. RESULT AND CONCLUSION

A. Results

The microcontroller initially provides the digital values of sensed parameters. If the specified values are below a certain threshold, the microcontroller will frequently send the output victimization transmitter (CC2500) from the native web site to the remote monitoring site. At the same time, the output is saved to the memory card for long-term storage. On the remote viewing website, values are received by the receiver (CC2500), which sends the output to the linear unit, which then translates the serial data into USB data, which is displayed at the Nurse Management Station. The outcome is displayed on a graphical user interface screen since it is saved in information for future use, and the doctor will see it onhis or her mobile victimization web.

B. Conclusions

This mandated initiative aims to develop a technical and advanced solution to a major problem at the hospital, such as monitoring the patient's condition online, and is designed to raise widespread awareness about how technology can be used in emergency situations. This approach is a real-time, mobile system. Wearable sensors could be employed in a more advanced health monitoring system. Various sorts of wireless sensors could be used to improve the amount of time spent watching. [10] This project was obliged to upgrade to a wireless emergency telemedicine system. Other physical characteristics, such as patient posture, sugar level sensing, and so on, may be added in response to demand. Remote health monitoring enhances medical quality, lowers attention costs, and empowers patients.

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The system keeps track of the patient's health status, including graphs, heart rate, and temperature. If the value of any of those parameters exceeds specified critical values, the location parameters from the connected GPS module are sent to a predetermined number via SMS using a GSM module. The data collected from the figure from sensors and the graphical record filter circuit is then sent as digital values to the microcontroller system. The values received from the graphical record, rate, and temperature are also presented in alphamerical format on the connected LCD.

1) This mandated project aims to develop a technical and advanced solution to a major issue at the hospital, such as online monitoring of patient situations.
2) This project is expected to raise widespread knowledge about how technology can be used in emergency situations.
3) It is a real-time, mobile system.
4) The goal of this mandated project is to provide a solution for capturing patient body readings such as heart rate, blood pressure, and temperature using BP and temperature devices.
5) Designed Remote monitoring web site receives information from native site victimization receiver in both traditional and emergency circumstances and sends it to the doctor's smart phone.
6) This mandated effort resolves an emergency situation by sending a causation Associate in Nursing SMS to the doctor's smart phone.

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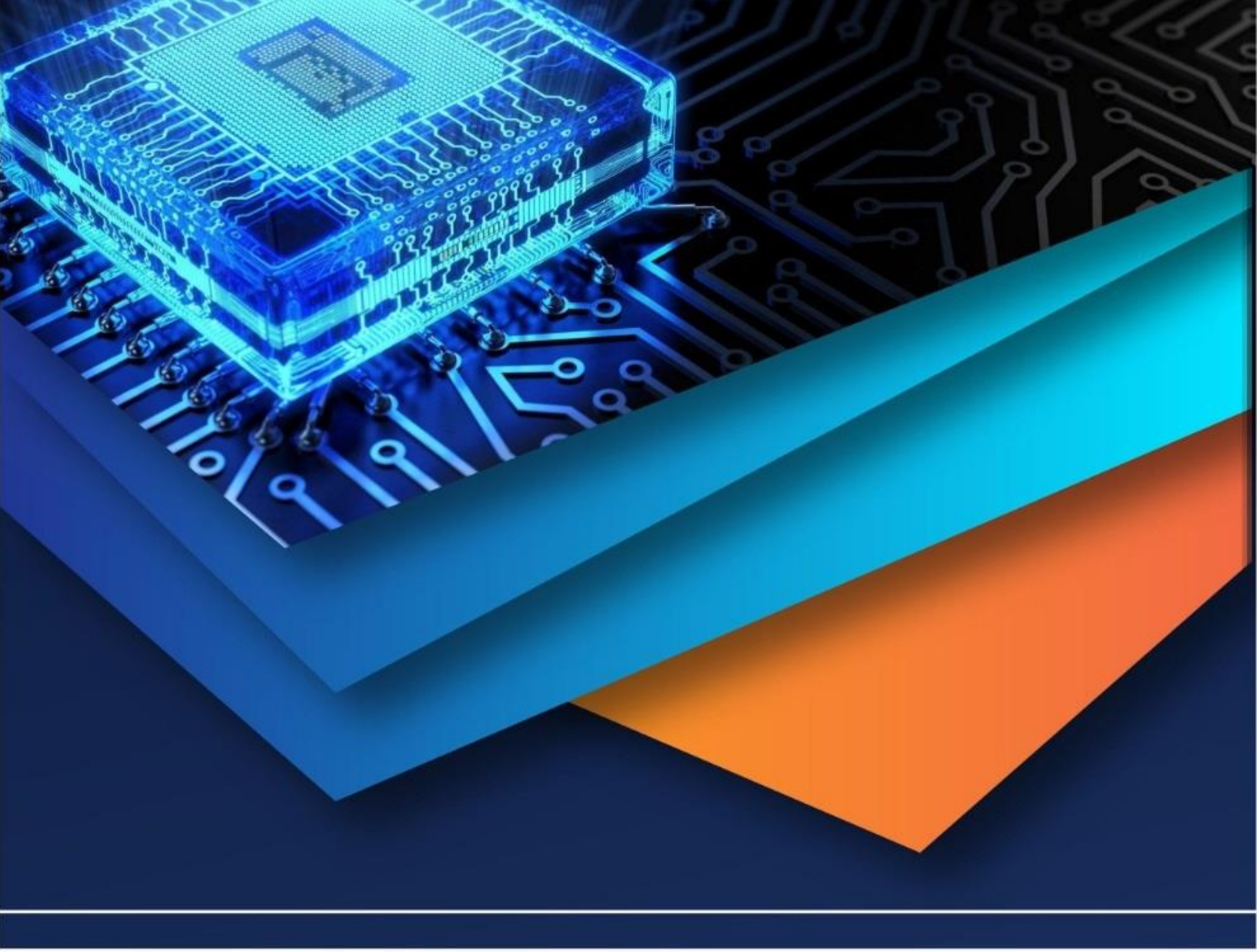

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