Keen Cardinal Hospital Administration System

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Abstract— Most of the people, aging around 35 to 45, suffer from few regular problems like arthritis, diabetes, blood pressure etc. These people have to go to the concerned specialists for regular checkups to maintain their health properly. The doctors advise the patients with necessary things to follow and also prescribe with medicines if necessary. The doctor maintains a record of the patient and also suggests the same to the patient. In this process, they provide prescriptions to the patients so as to bring along with them in their next visit. Whenever the patient goes to the doctor for his/her checkup, the doctor initially observes the prescription having the details of the patient's health record and then performs the basic tests like the pulse rate, body temperature of the patient, weight etc. There may be chances that the patient may lose the prescription while going to the doctor. Thus, the doctor has to perform the tests once again on the patient to get the overall idea of the patient's health. And also, most of the people nowadays prefer cards for everything rather than carrying records, cash with them. Thus, in order to avoid this, we have developed a project called Hospital Management System using Smart card. The patient will be provided with a health card when he visits to the doctor for the first time. The health conditions of the patient will be tested and all these details will be saved into his/her health card. When the patient comes to the doctor for his/her review, the patient has to insert the health card into the smart card reader present at the doctor. The parameters pertaining to the patient's health will be displayed on the LCD. Thus, the doctor after having a glance on these details will perform the tests once again if necessary and these values will be updated into the health card for the next review to the doctor. Finally all the details are stored in web server using IoT. This paper will focus on Li-Fi technology for transmitting personal information about patient.

Key words: Internet of Things (IoT), Light-Fidelity (Li-Fi), Smart Card, Hospital Management

I. INTRODUCTION

Automation systems in hospitals serve the purpose of providing an efficient working environment for health care professionals. Access to accurate health data quickly is one of the main functions of this system. There can be many sources that the information related to the patients can be obtained from the patient, test results, doctor diagnoses for patient illness, health measurement devices and previously stored patient information. The usual way of obtaining relevant data is from paper record. The Paper-based records have a low cost and have limitations such as difficult to access, time-consuming to update, secure, impossible to share and maintain for life long. The problems can be solved by increasing the capabilities of hospital automation systems by using intelligent storage and retrieval mechanism. Smart card can play a key role in sharing patient specific information. The patient can carry the health smart card with him/her anywhere and anytime and present it to the doctor at the time of consultation. Smart cards are more suitable to use in health care information systems because of they are cheap, easy to use, carry and update with new information and should not get damaged easily. Smart cards can be described as portable integrated devices that store and process data. These tiny computers with their own memories and processors have a widespread usage especially in telecommunication and mass transit systems .Speed, security and portability properties make smart cards a potential tool in healthcare systems. The details in the smart card are loaded into the web server using Internet of Things which is normally defined as a cloud computing storage environment. The data such as temperature, heartbeat, etc. are fetched with the help of the Li-Fi technology which is merely a transmission of data with the help of light medium.

II. RELATED WORK

The primary use of smart card is to provide security. The electronic smart card is used in various application in finance and health care sector. The electronic smart card as an efficient use of it in terms of security (privacy, confidentiality, Integrity and authenticity) in health care and finance sector. In[3] author explained about the RFID and how it can be used in cloud infrastructure .The various use of RFID in today's world as been explained and how it can be utilized in various domain. The RFID contain Reader Writer tag which can be used in smart card application. The cloud infrastructure is used as a storage resource .The health care systems will be benefited in terms of cost and utilization of resources. It offers new possibilities to access and ubiquitous management of health care data. It will improve the adoption and maintainability of evolving technologies. This will ensure the use of up-to date technologies and skilled technical manpower to manage health care systems in an efficient and effective way. And they have stored the information on the smart card for the future reference. The use of electronic health system makes it easy to store and transfer the information. The use of smart card for the electronic system will provide the security to the data, maintenance and updating it will be an easier task. The authors have used expert diagnosis system based on the cloud storage.

III. TECHNOLOGIES AND ARCHITECTURE

Smart cards are plastic, pocket-sized cards including integrated circuits. They were first realized in 1974, mainly for use as an electronic purse for telephone services. Since then, the applications of smart cards have expanded in many domains; they are used in financial transactions, for identification and personnel monitoring, tickets for public transit and healthcare services. Smart cards can be categorized, depending on their contact technology, in contact smart cards, contactless smart cards and hybrids.

Contact smart cards have a contact area, comprising several gold-plated contact pads which provide electrical connectivity when the card is inserted into a card reader while power is supplied by the reader. Contactless smart cards on the contrary communicate and are powered wirelessly through RF induction technology and only require proximity with an antenna for communication establishment. Hybrids implement both approaches on one card allowing both contact and contactless communication. We will further analyze contact smart cards since the contactless technology infers greater security risks and is not recommended in applications where security requirements are very strict. The term smart card in this paper implies contactless smart cards. The physical dimensions, shape, electrical characteristics, communication protocols, functionality of a contact smart card and the electrical connector's positions and shapes are defined through the series of standards ISO/IEC 7810 and ISO/IEC 7816.

IV. BLOCK DIAGRAM

The block diagram of the proposed system is illustrated in the figure given below:

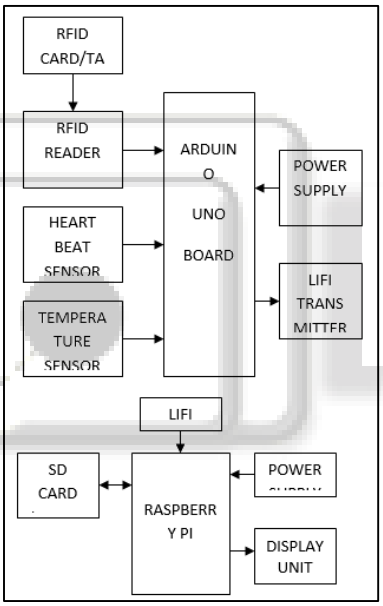

Fig. 1: Block diagram

Radio-Frequency Identification (RFID) is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked.

Fig. 2: RFID

A RFID system is made up of two parts: a tag or label and a reader. RFID tags or labels are embedded with a transmitter and a receiver. The RFID component on the tags has two parts: a microchip that stores and processes information, and an antenna to receive and transmit a signal. The tag contains the specific serial number for one specific object. To read the information encoded on a tag, a two-way radio transmitter-receiver called an interrogator or reader emits a signal to the tag using an antenna. The tag responds with the information written in its memory bank. The interrogator will then transmit the read results to an RFID computer program.

There are two types of RFID tags: passive and battery powered. A passive RFID tag will use the interrogator's radio wave energy to relay its stored information back to the interrogator. A batter powered RFID tag is embedded with a small battery that powers the relay of information. In a retail setting, RFID tags may be attached to articles of clothing. When an inventory associate uses a handheld RFID reader to scan a shelf of jeans, the associate is able to differentiate between two pairs of identical jeans based upon the information stored on the RFID tag. Each pair will have its own serial number.

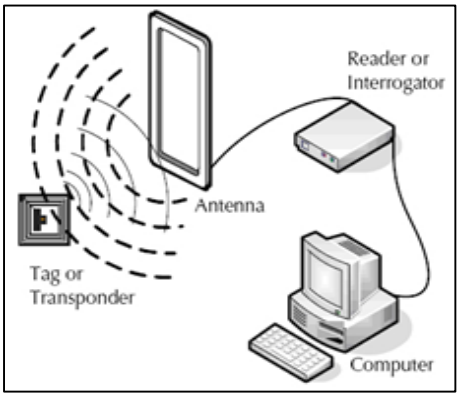

Fig. 3: Working of RFID reader

With one pass of the handheld RFID reader, the associate can not only find a specific pair, but they can tell how many of each pair are on the shelf and which pairs need to be replenished. The associate can learn all of this information without having to scan each individual item. RFID tags are used in many industries, for example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows positive identification of animals.

Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.[2] These concerns resulted in standard specifications development addressing privacy and security issues. ISO/IEC 18000 and ISO/IEC 29167 use on-chip cryptography methods for untraceability, tag and reader authentication, and over-the-air privacy. ISO/IEC 20248 specifies a digital signature data structure for RFID and barcodes providing data, source and read method authenticity. This work is done within ISO/IEC JTC 1/SC 31 Automatic identification and data capture techniques.

V. HARDWARE SPECIFICATIONS

A. Heart Beat Sensor

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart beats per minute (BPM), is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse. Heart Beat can be measured based on optical power

variation as light is scattered or absorbed during its path through the blood as the heart beat changes.

1) Principle of Heartbeat Sensor

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses. There are two types of photophlethy smography:

- Transmission: Light emitted from the light emitting device is transmitted through any vascular region of the body like earlobe and received by the detector.
- Reflection: Light emitted from the light emitting device is reflected by the regions.

2) Working of a Heartbeat Sensor

The basic heartbeat sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, i.e. light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate.

This signal is actually a DC signal relating to the tissues and the blood volume and the AC component synchronous with the heart beat and caused by pulsatile changes in arterial blood volume is superimposed on the DC signal. Thus the major requirement is to isolate that AC component as it is of prime importance.

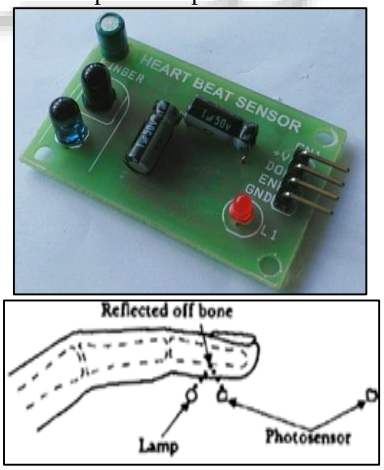

Fig. 4: Circuit

B. Temperature Sensor

Simply speaking, temperature is the degree of hotness of the body which is a measure of the heat content in the body. The problem to quantify the heat content of the body on a scale did not arise until the invention of the Steam Engine. The curiosity of scientists to understand the behavior of water at different levels of heat contents gave rise to a formal and better laid out study. One of the first references for 'temperature' dates back to 1760, when Joseph Black declared that applying the same heat to different materials resulted in different temperatures. Years of rigorous scientific study led to many theories ranging from the simple 'Caloric' concept, which treated heat as a material substance which is exchanged among materials, to Carnot's description of heat as a form of energy (which laid the foundation of the first law of thermodynamics). However, none of them satisfactorily explained the concept of temperature. It was Maxwell's theory which offered good reasoning into it. He defined temperature of a body as is its thermal property which provides information about the energy content of the system. It is the measure of the average kinetic energy (energy by virtue of motion) of the molecules of the substance and signifies a heat potential due to which heat flows from higher temperature to lower temperature.

The word 'temperature' itself is said to be derived of the Latin word 'tempera' meaning 'moderate or soften'. Moving along Maxwell's line of thought, the velocity of molecules should be the basis of selecting the value of temperature, with absolute heartlessness being a state where the molecules are totally static. But, this measurement is not possible practically, and hence, other manifestations of the effect of heat are utilized to measure temperature.

C. Arduino Board

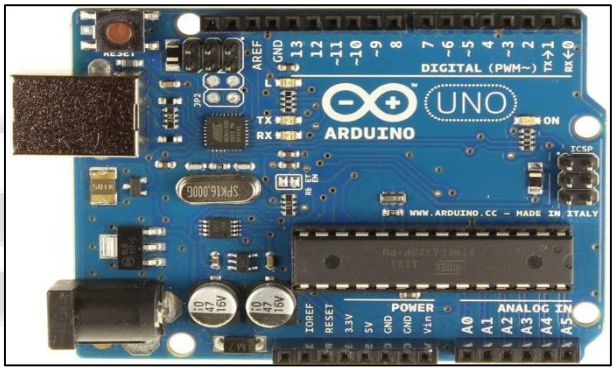

Fig. 5: Arduino

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. The Arduino project started in 2005 as a program for students at the Interaction Design

Institute Ivrea in Ivrea, Italy,[2] aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors. The name *Arduino* comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

D. Li-Fi Technology

Light Fidelity or Li-Fi is a Visible Light Communications (VLC) system running wireless communications travelling at very high speeds. Li-Fi uses common household LED (light emitting diodes) lightbulbs to enable data transfer, boasting speeds of up to 224 gigabits per second. Li-Fi and Wi-Fi are quite similar as both transmit data electromagnetically. However, Wi-Fi uses radio waves while Li-Fi runs on visible light. As we now know, Li-Fi is a Visible Light Communications (VLC) system. This means that it accommodates a photo-detector to receive light signals and a signal processing element to convert the data into 'stream-able' content. An LED lightbulb is a semi-conductor light source meaning that the constant current of electricity supplied to an LED lightbulb can be dipped and dimmed, up and down at extremely high speeds, without being visible to the human eye. For example, data is fed into an LED light bulb (with signal processing technology), it then sends data (embedded in its beam) at rapid speeds to the photo-detector (photodiode).The tiny changes in the rapid dimming of LED bulbs is then converted by the 'receiver' into electrical signal.

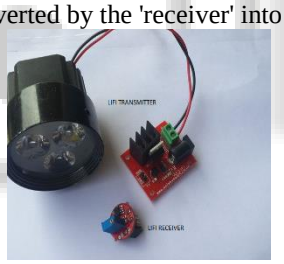

Fig. 6: LiFi Technology

E. Raspberry Pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries.[The original model became far more popular than anticipated,[6] selling outside of its target market for uses such as robotics. Peripherals (including keyboards, mice and cases) are not included with the Raspberry Pi. Some accessories however have been included in several official and unofficial bundles

- SoC: Broadcom BCM2837 (roughly 50% faster than the Pi 2)
- CPU: 1.2 GHZ quad-core ARM Cortex A53 (ARMv8 Instruction Set)
- GPU: Broadcom Video Core IV @ 400 MHz
- Memory: 1 GB LPDDR2-900 SDRAM
- USB ports: 4
- Network: 10/100 MBPS Ethernet, 802.11n Wireless LAN, Bluetooth 4.0

Fig. 7: Li Fi Technology

The Raspberry Pi 3, with a quad-core Cortex-A53 processor, is described as 10 times the performance of a Raspberry Pi 1This was suggested to be highly dependent upon task threading and instruction set use. Benchmarks showed the Raspberry Pi 3 to be approximately 80% faster than the Raspberry Pi 2 in parallelized tasks. Raspberry Pi 2 includes a quad-core Cortex-A7 CPU running at 900 MHz and 1 GB RAM. It is described as 4–6 times more powerful than its predecessor. The GPU is identical to the original.[16] In parallelized benchmarks, the Raspberry Pi 2 could be up to 14 times faster than a Raspberry Pi 1 Model B+.While operating at 700 MHz by default, the first generation Raspberry Pi provided a real-world performance roughly equivalent to 0.041 GFLOPS. On the CPU level the performance is similar to a 300 MHz Pentium II of 1997–99. The GPU provides 1 Gpixel/s or 1.5 Gtexel/s of graphics processing or 24 GFLOPS of general purpose computing performance. The graphical capabilities of the Raspberry Pi are roughly equivalent to the performance of the Xbox of 2001.The LINPACK single node compute benchmark results in a mean single precision performance of 0.065 GFLOPS and a mean double precision performance of 0.041 GFLOPS for one Raspberry Pi Model-B board. A cluster of 64 Raspberry Pi Model B computers, labeled "Iridis-pi", achieved a LINPACK HPL suite result of 1.14 GFLOPS (n=10240) at 216 watts for c. US$4000.

VI. Conclusion

Hospital Management System not only provides an opportunity to the hospital to enhance their patient care but also can increase the profitability of the organization. Hospital Management System would enable hospitals or Nursing homes to serve the rapidly growing number of health care consumers in a cost-effective manner. Hospital Management System can also save extra money on your current computer hardware shopping. Check up with our executive to more on these Hospital administrators would be able to significantly improve the operational control and thus streamline operations this would enable to improve the response time to the demands of patient care because it automates the process of collecting, collating and retrieving patient information. Accounting sometimes becomes awfully pathetic and complex. This product will eliminate any such complexity, since the retrieval of information through its MIS will become virtually on the tip of your fingers. Very important for some, the reduced cost of the manpower would pay for the cost of this product within a short time after its implementation.

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