ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 2, Issue 6, June 2017

Patient Healthcare Monitoring System Using IoT

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Abstract: **Advances in information and communication technologies have led to the emergence of Internet of Things (IoT). In the advanced medicinal service environment, the utilization of IoT system brings convenience of doctors and patients as they are applied to different medical areas (for example, real-time monitoring, patient information management, and healthcare management). The body sensor network (BSN) technology is one of the main technologies of IoT developments in medical system, where a person under treatment can be observed utilizing a set of low power and portable wireless sensor nodes. This paper presents an economical and versatile body sensor network system using an embedded micro-web server, with internet access for getting and controlling the remotely using Android phone app. To demonstrate the practicality and viability of this system, devices such as light switches, power plug, temperature sensor and current sensor have been integrated to design introduce a safe IoT based healthcare system using BSN, called BSN-Care, which can effectively fulfill those requirements. It is highly critical to monitor various medical parameters and post operational data. To get the patient's medical readings in local and remote area, healthcare communication using Internet of Things (IoT) technique is taken under use.The main purpose of this paper is to transmitting the patient's health monitoring parameters through wireless communication. These input data are uploaded in cloud server and transmitted to the computer and mobile for family and specialist's reference.**

Index Terms— **Authentication, Body Sensor Networks, Internet of Things (IoT), Security**

I. INTRODUCTION

The most few decades have witnessed an unfaltering increase in life time of people in many parts of the earth leading to a steep rise in the number of senior citizens. A recent report from United Nations foretold that there will be 2 billion (22% of the world population) older people by 2050. Also, research indicates that about 89% of the senior citizens will possibly live freely. In any case, medical research studies understood that about 80% of the aged people older than 65 suffers from at least one chronic disease causing many aged people to have difficulty in taking care of themselves. Accordingly, providing a decent quality of life for aged people has become a serious social challenge at that moment. The rapid proliferation of information and communication technologies is enabling innovative healthcare solutions and tools that show promise in addressing the aforesaid challenges. Presently, Internet of Things (IoT) has become one of the most dominating communication ideas of the 21th century. In the IoT environment, all things in our day to day life become part of the internet due to their communication and processing abilities (including micro controllers, transceivers for digital communication). IoT spreads the concept of the Internet and makes it more unavoidable. IoT allows seamless communication among different types of devices such as medical sensor, monitoring cameras, home appliances so on. Due to this reason IoT has become more beneficial in several fields such as healthcare system. In healthcare system, IoT includes many kinds of low cost sensors (wearable, implanted, and environment) that enable the elderly to enjoy modern medical healthcare services at any place, any time. Further, it also greatly improves aged peoples quality of life. The body sensor network (BSN) technology is one of the most basic advances utilized as a part of IoT-based modern healthcare system. It is fundamentally a set of low-power and mobile wireless sensor nodes that are used to observe the human body's functioning and surrounding climate. Since BSN nodes are utilized to assemble life-critical data and may work in hostile surroundings, in like manner, they require stringent security mechanisms to avoid unwanted interaction with the system. In this article, at first we focus on the few security requirements in BSN based modern healthcare system. At that point, we propose a safe and reliable IoT based healthcare system using BSN, called BSN-Care, which can ensure to proficiently achieve those requirements. Therefore, the rest of the article is organized as follows. In Section III, we present a list of security factors which are necessary to be concentrated on in any IoT based healthcare system using BSN. Section IV we will describe the proposed methodology. Section V and VI provides information about AES Encryption Technique and Error Correction Code(ECC) Technique , respectively. And Section VII gives the conclusion

II. LITERATURE SURVEY

Progresses in data and communication technologies have led to the rise of Internet of Things (IoT). In the modern health care environment,[1]they propose an anonymous authentication scheme, which can ensure some of the notable properties, such as sensor anonymity, sensor non-traceability, resistance to replay attacks, cloning attacks, and so on. It is debated that the authentication scheme under discusson will be useful in many distributed IoT applications, the utilization of IoT technologies brings accommodation of doctors and people under treatment since they are connected to different medical areas (for example, real-time monitoring, patient information management, and healthcare management).

The body sensor network (BSN) technology is one of the primary technologies of IoT improvements in medi-care system, where a patient can be observed using a collection of low power and portable wireless sensor nodes.[2]The design and implementation of a Zigbee based wearable physiological parameters monitoring device has been developed and reported in this paper. The system can be used for monitoring physical parameters of the human body, for example, heart rate and temperature of a human body.[3] It is just viewed as a machine with inputs from human beings giving required outputs. However the term or the growing field of Body Area Networks gives new importance or emphasis now to the term "personal" in PCs.In short, this wireless technology emphasizes on wireless communications protocols permitting low-power sensors to interact with one another and send data to a local base station and to far away places like hospitals.[4] Recent cognizance and developments in Wireless Body Area Networks (WBANs) has increased considerably, in no small part because of the interest for health monitoring devices, not only for use in professional healthcare organisations, in fact also from an ever increasing number of health conscious individuals.

In this work, They introduce a mobile device based wireless healthcare monitoring system that can deliver real time accessible data about health conditions of a patient. The suggested system is intended to evaluate and observe important physiological data of a person under observation in order to precisely depict the status of her/his health and fitness.

III. SECURITY REQUIREMENTS IN IOT BASE HEALTHCARE SYSTEM USING BSN

Security is critical element amongst the most basic parts of any system. Individuals have alternate opinions in regards to security and thus it characterized from various perspectives. In general, security is an idea similar to safety of the system as a whole. Now, the communication in sensor network applications (like BSN) in healthcare are mostly wireless in nature. This may result in huge number security dangers to these systems. These are the security issues cloud pose serious problems to the wireless sensor devices. In this section, we describe the vital security necessities in IoT based healthcare system utilizing BSN.

A. Data Privacy**:** Like WSNs, data confidentiality is thought to be most significant matter in BSN. It is mandatory to safeguard the data from leaks. BSN should not expose the sick person’s critical data to outsiders or adjoining networks. In IoT-based healthcare application, the sensor nodes gather and forwards sensitive data to a coordinator. An adversary can eavesdrop on the communication, and can overhear critical information. This eavesdropping may cause severe damage to the patient since the adversary can utilize the acquired data for many illicit purposes.

B. Data Integrity**:** Keeping data confidential doesn’t protect it from external modifications. An adversary can always alter the data by including some fragments or by manipulating the data with in a packet. This altered data can be forwarded to the coordinator. Lack of integrity mechanism is sometimes very dangerous especially in case of life-critical (when emergency data is altered). Data loss can also occur due to the bad communication environment. B. Information Integrity

C. Data Freshness**:** The adversary may sometimes capture data in transit and replay them later using old key in older to confuse the coordinator. Data freshness implies that data is fresh and no one can replay the old message.

D. Authentication**:** It is one of the most important essential in any IoT based healthcare system using BSN, which can effectively deal with the impersonating attacks. In BSN based healthcare system, all the sensor nodes send their data to a coordinator. Then the coordinator sends periodic updates of the patient to a server. In this unique circumstance, it is profoundly basic to guarantee both the identity of the coordinator and the server. Authentication helps to confirm their identity to each other.

E. Anonymity**:** A more satisfactory property of the obscurity is the intractability, which ensures that the adversary can neither discern who the patient is not can tell apart whether two conversations originate from same (unknown) patient. Subsequently, anonymity hides the source of a packet (i.e. sensor data) during wireless communication. It is a service that can enable confidentiality.

***F. Secure Localization*:** Most BSN applications require precise estimation of the patient location. Lack of smart tracking mechanism permits an adversary to send in correct reports about the patient location by reporting false signal strengths. Now, in order to ensure a secure IoT-based healthcare system using BSN, it is highly imperative that the system should poses all the aforesaid security requirements and eventually can resist various security threats and attacks like data modification, impersonation, eavesdropping, replaying etc.

IV. METHODOLOGY

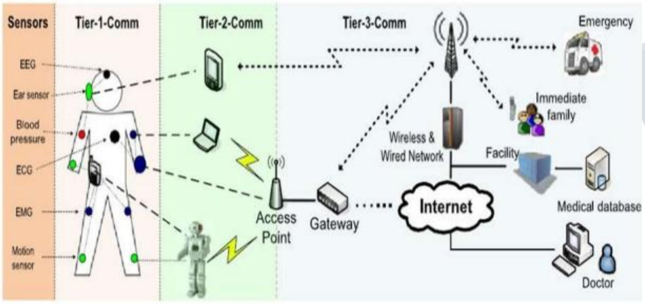


Figure 1: Architecture of Wireless Body Sensor Network

Tier 1- *WBAN Senor :* consist of intelligent node (sensing, sampling, processing and communicating) Sensor Architecture. Tier 2- Personal Server : Interface the WBAN Sensors Nodes through Zigbee or Bluetooth. It is associated with the medical server through mobile telephone networks (2G, GPRS, 3G) or WLANs – Internet. It is implemented regularly at cell phone. It manages the Network channel sharing, time synchronization and processing data. It sends data to MS. Tier 3- Medical Server : Its function is to authenticate user, save patient data into medical records, analyze the data, recognize serious health cases in order to contact emergency care givers and forward new instructions to users.Here, scientist designed health monitoring system utilizing ATmega8 microcontroller with Wireless Body Area Sensor Network (WBASN). In this work, the sensors are utilized here Temperature sensor, Blood pressure sensor, Heart beat sensor. These sensors are placed on human body which are helps to monitor the health condition without disturbing the daily routine of the patient's and these health related parameters are then communicated to physician's server using long range wireless technology. Body Sensor Network (BSN) allows the integration of intelligent, miniaturized low-power sensor nodes in, on or around human body to monitor body functions and the surrounding environment.

It has great potential to revolutionize the future of healthcare technology and attained a number of researchers both from the academia and industry in the past few years. Generally, BSN consists of in-body and on-body sensor networks. An in-body sensor network allows communication between invasive/implanted devices and base station. On the other hand, an on-body sensor network allows communication between non-invasive/wearable devices and a coordinator. When the BSN-Care server receives data of a person (who wearing several bio sensors) from LPU, then it feeds the BSN data into its database and analyzes those data. Sub-sequently, based on the degree of abnormalities', it may interact with the family members of the person, local physician, or even emergency unit of a nearby healthcare center. Precisely, considering a person (not necessarily a patient) wearing several bio sensors on his body and the BSN-Server receives a periodical updates from these sensors through LPU.

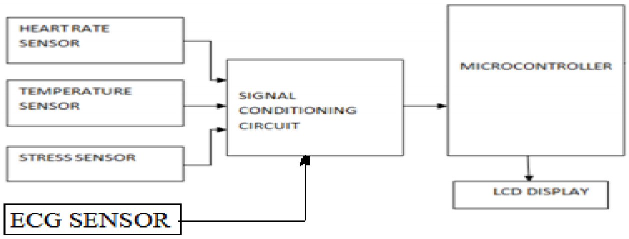


Figure 2: Proposed Methodology Block Diagram

Our BSN-Care (appeared in Fig. 1) is a BSN architecture composed of wearable and implantable sensors. Each sensor node is coordinated with biosensors, for example, Electrocardiogram (ECG), Electromyography (EMG), Electroencephalography (EEG), Blood Pressure(BP), etc. These sensors collect the physiological parameters and forward them to a coordinator called Local Processing Unit (LPU), which can be a portable device such as PDA,smart-phone etc. The LPU works as a router between the BSN nodes and the central server called BSN-Care server, using the wireless communication mediums such as mobile networks 3G/CDMA/GPRS. Also, when the LPU detects any abnormalities then it gives immediate alert to the person that wearing the bio-sensors. For example, in general BP less than or equal to 120 is normal, when the BP of the person reaches say 125, the LPU will provide a gentle alert to the person through the LPU devices (e.g. beep tone in a mobile phone).

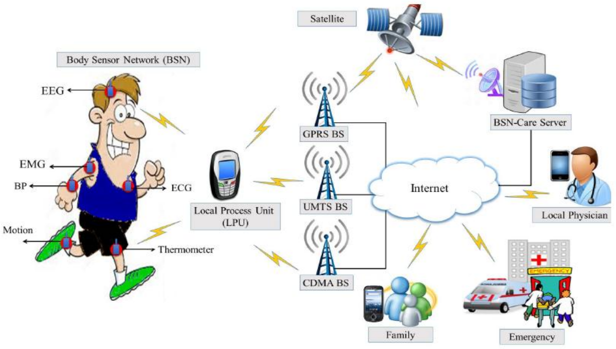


Figure 3. Secure iot-based modern healthcare system using bsn

There are three indispensable components in the IoT-based communication architecture such as the wearable body bio-sensors (i.e. the smart objects), the Local Processing Unit (LPU) (which would normally be an intelligent handheld device and acts as a mobile gateway), and the Body Sensor Networks (BSN) server. The IoT-based biomedical equipment (i.e. body bio-sensors) is adopted (or embedded) by the user as the edge devices which are responsible for collecting bio-data from the human (or, in this case, the patient). All of the collected data will be forwarded to the LPU and BSN server for data analysis and user-oriented service provision. That is, based on specific bio-data from the user, the system can recognize and satisfy the particular individual's needs in a faster and more efficient way.

For instance, by analyzing human bio-data, such as electrocardiography (ECG), electroencephalography (EEG), electromyography (EMG) and blood pressure (BP), a healthcare system in a hospital can provide more individually-tailored and timely services and reduce delays in medical treatment. In the proposed IoT-based communication architecture, all the body bio-sensors and the LPU need to perform registrations with the BSN server in advance. After registration, security credentials will be shared and stored among the bio-sensors, the LPU and the BSN server. The security credentials are exploited to achieve the goal of entity authentication and to establish a secure communication channel, and, in addition, data confidentiality and data integrity can be guaranteed via the system's secure communication feature. In our proposed healthcare system, two communication channels, i.e. “sensors to LPU” and “LPU to BSN server,” are focused on, since the openness of these two channels means it can’t be guaranteed that all the data transmissions on them are secure. An attacker (or hacker) may therefore wish to launch malicious behaviors, such as bio-data eavesdropping on a specific person and entity counterfeiting for purposes of spoofing, on these insecure channels. The result should be huge and unpredictable losses.

To sum up, the assumptions about the trust boundary of our IoT-based healthcare system are listed below:
(1) The security parameters received during the registration phase are under a secure channel;
(2) The LPU and sensors are equipped with secure storage;
(3) The “sensors toLPU” and “LPU to BSN server” channels are insecure, i.e. the transmitted data may be sniffed out;
(4) The BSN server is trusted and all the database accesses are safe and
(5) A trusted third party exists to support the public key infrastructure.

Our BSN-Care server maintains an action table for each category of BSN data that it gets from LPU. Table I signifies the activity table in view of the data receive from BP sensor, where we can see that if the BP rate is less than or equal to 120 then the server does not perform any action. Now, when the BP rate becomes greater than 130, then it informs family members of the person. If the BP rate becomes greater than 145 and there is no one attending the call in family, then the server will contact the local physician. Besides, if the BP rate of the person cross 160 and still there is no response from the family member or the local physician then the BSN-Care server will inform an emergency unit of a healthcare center and securely gives the location of the person. Here, the response parameters“FR” (Family Response), “PR” (Physician Response), and“ER (Emergency Response) are the Boolean variables, which can be either true (T) or false (F). If the value of any response parameter is false, then the server repeats its action. For example, when the family response parameter"FR: F", then the server over and over call his relatives.

Once, the family members of the concern person pick-up the call, then the value of the family response parameter(FR) will become true i.e. “FR: T”. Now, if “FR:F” and BP > 130 then the BSN-Care server will call the local physician. In case, when the physician also does not respond to the server’s call, then the value of the physician response parameter “PR” will stay in false. In this regard, the server will over and over call both the family members and the the physician. Unless any of the response parameter (FR, PR) value becomes true. Meanwhile, if “FR: F”, “PR: F” and BP >160, then the BSN-Care server immediately inform to the emergency unit of a

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 2, Issue 6, June 2017

healthcare centre nearest to the concern person. Once the emergency unit responds, then the value of the emergency response parameter “ER” will become true i.e. “ER: T”. It should be noted that, our BSN-Care system is not only designed for the patient, instead of that it can be useful for giving a decent quality of life for the aged people.

Table 1 Example of action table using BP data

BSN BP data	Action	Response
BP≤120	No action	Null
BP>130	Inform family member	FR:T/F
BP>160 and FR:F	Inform local physician	PR: T/F
BP>160 ,FR:F&PR:F	Inform emergency	ER:T/F

- FR: Family Response
- PR: Physician Response
- ER:Emergency Response

A. System block Diagram:

The diagram is separated into two sections: node as Transmitter and raspberry as receiver. In the transmitter section the gathered data is stored in the Raspberry Pi B+ and the data is sent to the server using GSM or Ethernet module. In the receiver section a web page is built and data collected is displayed on the web page.

In BSN system we authorization of security in BSN-care system we isolate the all security requirements (mentioned above) into two parts: network security, and data security. Network Security comprises authentication, anonymity, and secure localization.

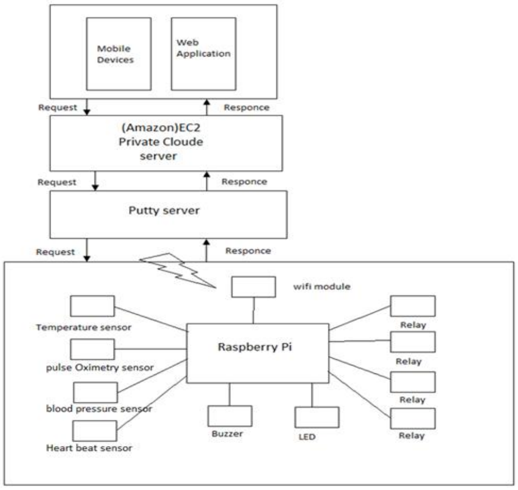


Fig 4: System Block Diagram

In Existed model an Ethernet based system that let clients screen continuous exchanging data of the electrical gadgets and controlling them through an android application and additionally checking the security of their homes in the event of undesirable passage or fire. Our model uses temperature sensor and to check the temperature level of human body. Pulse Oximetry sensor is utilized to measure the oxygen saturation of arterial blood in a subject by utilizing a sensor attached typically to a finger, toe, or ear to decide the rate of ox hemoglobin in blood throbbing through a system of vessels.

Blood pressure sensor is utilized to measure the blood pressure of human body; Heart beat sensor is used to calculate the heart beats per second. Buzzer & LED will demonstrate any adjustments in body to suggest the closest individual. This devices threshold level is adjusted through an android based mobile app as well as the web application. The system is connected to this application using internet connectivity for communication. The model has an option of controlling devices by either sending tap-to-toggle system and allows the permission level setting for security, making the system user friendly and easy to manage. It is Raspberry Pi certificated and designed to be hardware, programming, and pin compatible with large range of Raspberry Pi shields. The application is android and online which is associated with the web intensive either Wi-Fi. It interfaces with the putty based server which is associated with cloud server over the web and lets the clients to screen with the assistance of an inner sensor and flips the edge level by tap-to-touch and setting the usefulness. The alert is sent continuous to the client application also indicated by buzzer & LED.

V. AES ENCRYPTION TECHNIQUE

AES (acronym of Advanced Encryption Standard) is a symmetric encryption algorithm. The algorithm was developed by two Belgian cryptographer Joan Daemen and Vincent Rijmen. AES was designed to be efficient in both hardware and software, and supports a block length of 128 bits and key lengths of 128, 192, and 256 bits.

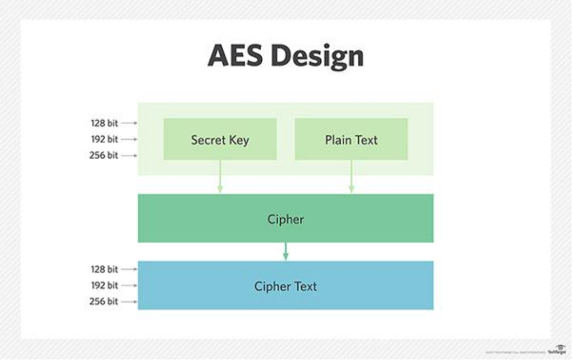


Fig 5:Aes Design

AES includes three block ciphers: AES-128, AES-192 and AES-256. Each figure scrambles and decodes information in blocks of 128 bits utilizing cryptographic keys of 128-, 192-and 256-bits, individually. The Rijndael figure was intended to acknowledge additional block sizes and key lengths, yet for AES, those capacities were not embraced.Symmetric (otherwise called secret key) ciphers utilize a identical key for encrypting and decrypting, so the sender and the recipient must both know and utilize an identical secret key. Every single key length are regarded adequate to ensure ordered data up to the "Secret" level with "Top Secret" data requiring either 192-or 256-piece key lengths.

There are 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-piece keys a round comprises of a no. of processing steps that incorporate substitution, transposition and mixing of the information plain text and change it into the end output of cipher text. The AES encryption algorithm characterizes various changes that are to be performed on information saved in a array.The first step of the cipher is to put the data into an array; after which the cipher transformations are repeated over a number of encryption rounds. The quantity of rounds is decided by the key length, with 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-piece keys. The principal change in the AES encryption cipher is substitution of information utilizing a substitution table; the second transformation shifts data rows, the third mixes columns. The last transformation is a simple exclusive or (XOR) operation performed on each column using a different aspect of the encryption key longer keys need more rounds to complete. AES has proven to be a reliable cipher, and the only practical successful attacks against AES have leveraged side-channel threats on weaknesses found in the implementation or key management of specific AES-based encryption products.

Side-channel attacks take advantafe loop holes in the way a cipher has been implemented rather than brute force or theoretical weaknesses in a cipher. The Browser Exploit Against SSL/TLS (BEAST) browser misuse against the TLS v1.0 convention is a fine case; TLS can utilize AES to encrypt information, however because of the data that TLS uncovered, assailants managed to predict the initialization vector block used at the start of the encryption process.

A. AES Encryption

Sub Bytes— a non-linear substitution step where every byte is supplanted with another as per a query table.

- *Shift Rows*— a transposition step where each row of the state is moved consistently a specific number of steps.

- *Mix Columns*— a mixing operation which works on the columns of the state, consolidating the four bytes in every column

- *Add Round Key*— every byte of the state is joined with the round key; each round key is taken from the figure key utilizing a key schedule

B. AES Decryption

Reverse of encryption which inverses round changes to process the first plaintext from figure message backward request called as decryption. The rounds of transformation of decryption utilize the capacities AddRoundKey, InvMixColumns, InvShiftRows, and InvSubBytes progressively as appeared in fig. 2

- *AddRoundKey*

AddRoundKey is its own particular inverse function in light of the fact that the XOR capacity is its own inverse. Here cipher text state XOR with round key .The round keys obtained from key expansion algorithm selected in reverse order..

- *InvShiftRows Transformation*

InvShiftRows functions in the same way as the ShiftRows, only in the reverse way. The first row is not shifted, while the second, third and fourth rows gets shifted to right by one, two and three bytes respectively.

- *InvSubBytes transformation*

From once-precalculated substitution table called InvS-box, InvSubBytes transformation is done. InvS-box table consists of 256 numbers (from 0 to 255) and their corresponding values.

- *InvMixColumns Transformation*

InvMixColumns transformation includes, ,polynomials of degree less than 4 over GF (2 8) which coefficients are the elements in the columns of the state, are multiplied modulo (x 4 + 1) by a fixed polynomial d(x) = {0B}x 3 + {0D}x 2 + {09}x + {0E}, where {0B}, {0D}; {09}, {0E} denote hexadecimal values.

VI. ERROR CORRECTION CODE (ECC) TECHNIQUE

ECC (either "error correction [or correcting] code" or "error checking and correcting") permits data that is being read or sent to be cross check for errors and, when needed, corrected on the go. It is different from parity checking in that errors are not only detected but also corrected. ECC is more and more being developed into data storage and transmission hardware as data rates (and therefore error rates) go up. Hamming codes are a family of linear error-correcting codes that generalize the Hamming (7,4)-code. Hamming codes are perfect codes, i.e., they provide the fastest achievable rate for codes with their block length and least distance of three. Hamming codes are a class of binary linear codes. For each integer r = 2 there is a code with block length n = 2r - 1 and message length k = 2r - r - 1. Hence the rate of Hamming codes is R = k/n = 1 - r/(2r - 1), which is the fastest acheivable for codes with least distance of three (i.e., the minimum number of bit changes expected to go from any code word to whatever other code word is three) and block length 2r - 1. The parity-check framework of a Hamming code is developed by posting all columns of length r that are non-zero, which implies that the double code of the Hamming code is the abbreviated Hadamard code. The parity check framework has the property that any two columns are pairwise linearly independent.

A. Hamming Codes - Error Detection and Error Correction

The key to the Hamming Code is the usage of additional parity bits to allow the discovering of a solitary error. make the code word as takes after: Mark all bit areas that are powers of two as parity bits. (positions 1, 2, 4, 8, 16, 32, 64, and so forth.) All other bit positions are for the information to be encoded. (positions 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 17, and so forth.)

Each parity bit computes the parity for a portion of the bits in the code word. The position of the parity bit decides the succession of bits that it then again checks and skips. Position 1: check 1 bit, skip 1 bit, check 1 bit, skip 1 bit, and so forth. (1,3,5,7,9,11,13,15,...) Position 2: check 2 bits, skip 2 bits, check 2 bits, skip 2 bits, etc.
(2,3,6,7,10,11,14,15,...)

Position 4: check 4 bits, skip 4 bits, check 4 bits, skip 4 bits, etc. (4,5,6,7,12,13,14,15,20,21,22,23,...)

Position 8: check 8 bits, skip 8 bits, check 8 bits, skip 8 bits, etc. (8-15,24-31,40-47,...)
Position 16: check 16 bits, skip 16 bits, check 16 bits, skip 16 bits, etc.
(16-31,48-63,80-95,...)

Position 32: check 32 bits, skip 32 bits, check 32 bits, skip 32 bits, etc. (32-63,96-127,160-191,...) etc.

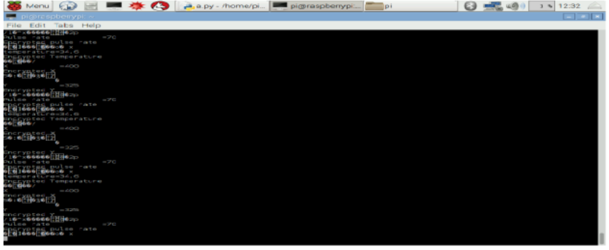
Set a parity bit to 1 when the aggregate no. of 1s in the positions it checks is odd. Set a parity bit to 0 when the aggregate no. of 1s in the positions it checks is even. Here is an illustration: Byte of information: 10011010 Create the data word, leaving spaces for the parity bits: _ _ 1 _ 0 0 1 _ 1 0 1 0 Calculate the parity for each parity bit (a ? represents the bit position being set): Position 1 checks bits 1,3,5,7,9,11:
? _ 1 _ 0 0 1 _ 1 0 1 0.
Even parity so set position 1 to a 0: 0 _ 1 _ 0 0 1 _ 1 0 1 0 Position 2 checks bits 2,3,6,7,10,11:
0 ? 1 _ 0 0 1 _ 1 0 1 0. Odd parity so set position 2 to a 1: 0 1 1 _ 0 0 1 _ 1 0 1 0 Position 4 checks bits 4,5,6,7,12:
0 1 1 ? 0 0 1 _ 1 0 1 0. Odd parity so set position 4 to a 1: 0 1 1 1 0 0 1 _ 1 0 1 0 Position 8 checks bits 8,9,10,11,12:
0 1 1 1 0 0 1 ? 1 0 1 0.

Even parity so set position 8 to a 0: 0 1 0 1 0 1 0 1 0 Code word: 011100101010. Discovering and setting a bad bit The above case made a code expression of 011100101010.

Assume the word that was gotten was 011100101110. At that point the receiver could compute which bit wasn't right and right it. The technique is to confirm each check bit. Record all the off base parity bits. Doing as such, you will find that parity bits 2 and 8 are incorrect. It is not a fortuitous event that 2 + 8 = 10, and that bit position 10 is the area of the corrupted bit. When all is said in done, check every parity bit, and include the positions that aren't right, this will give you the area of the corrupted bit.

VII. EXPERIMENTAL RESULT

In the figure 6 gives the different types of pulse rate of patient also its encrypted pulse rate. Then temperature is display on the screen.



```
[illegible]
Pulse rate              =70
Encrypted pulse rate
[illegible]
temperature=34.6
Encrypted Temperature
[illegible]
x            =400
Encrypted X
[illegible]
Y            =325
Encrypted Y
[illegible]
Pulse rate              =70
Encrypted pulse rate
[illegible]
temperature=34.6
Encrypted Temperature
[illegible]
x            =400
Encrypted X
[illegible]
Y            =325
Encrypted Y
[illegible]
Pulse rate              =70
Encrypted pulse rate
[illegible]
temperature=34.6
Encrypted Temperature
[illegible]
x            =400
Encrypted X
[illegible]
Y            =325
Encrypted Y
[illegible]
Pulse rate              =70
Encrypted pulse rate
[illegible]
```

Fig 6:Result of Temperture and Pulse Rate

VII. CONCLUSION

In this paper at first we have depicted the security and the privacy issues in medicinal services applications using body sensor network (BSN). Thusly, we found that even though majority of the BSN based research projects recognize the matter of the security, yet they are not able to to embed robust safety services that could be preserve the sick person's confidentiality. Finally, we proposed a safe IoT based healthcare system using BSN, called BSN-Care, which can effectively achieve various security requirements of the BSN based healthcare system. After a detailed survey of current work and concentrated research a BSN system has been proposed to counter all the security related problems faced by existing positioning without settlement in performance and adaptability.

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