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Quantum Technology with Integration Aspects of Wireless Body Area Network for Health Care Analytics

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Abstract

Wireless body sensor network is a wireless network of wearable computing devices that may be embedded inside the body and also mounted on the human body. WBSN technology consists of a number of physiological sensors integrated into wearable wireless body area networks. This can be used for rehabilitation which is computer assisted and early detection of medical conditions. The use of WBSN has increases in recent times in various areas like health care industry, monitoring of traffic, infrastructure etc. In health care industry, the body area network field is an interdisciplinary area that allows continuous health monitoring with the real time updates of medical records with the help of internet. The sensors that are implanted in a human body collect various physiological changes in order to monitor the patient's health status. These sensors are without cable helps to reduce the patient stress. In case of

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emergency, the patient is immediately informed through the computer system with appropriate messages or alarm. At that time information can be effectively used and effectively processed to obtain accurate and reliable physiological estimations and allow distant doctor to have real time opinions. The network field of body is an interdisciplinary area which allows continuous real time health monitoring.

Keywords : Wireless Technologies, Quantum Computing, IoT, Internet of Things, Medical Domain and IoT

Introduction

A new revolution has taken place in the medical field by the use of wireless body sensor network. There is no doubt in this, it has not only reduced the mortality rate, but also provided additional good facilities to the patient. Changes in the medical field along with constant progress have also been felt. In today's time, not only patient, healthy person also wants to get medical observation and guidance at all times whether it is home, office, gymnasium, playground, market or elsewhere. The patient can live in medical observation all the time [1].

Health care sensors play a vital role in hospitality (Zhong, 2010). With the help of these sensors, the medical specialists can monitor the condition of a patient and can save his life even from a different location. Embedded technology is used for monitoring the patient condition easily. Health care monitoring system is used in transferring the data from transmitter to receiver wirelessly. It focuses on the condition where the doctors and patients at remote location and it is very significant to give the entire data of the patient to the doctor [2].

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Protecting the patient's personal data, after all these facilities, is not only a medical center but main responsibility of a safe and secure wireless system. There should be no loss or leakage of the data of the patient, as well as the efforts should be made to maintain the confidentiality of the data. Apart from the safety of the patient's data in this proposed research work, along with various issues, the most suitable routes for finding patient's real time monitoring and proportional location has been found. Main Problem statement of the proposed research are as follows :-

- A new system is being proposed that would attempt to keep track and monitor wireless devices that are being used in the patient's body.
- the patient's bodily signals will be used to update and enhance the existing trends in medical broadcasting
- The proposed system would make use of cutting-edge cryptographic approach to continually aid in the flow of correct information, while also preventing network users and their data from being illegally accessed.
- The proposed system would aim to assist maintain the patient's health by improving the diagnosing system.

Research Perspectives

In this research, special attention is given to keep user's personal data secure and to get medical advice immediately. Along with, it is also very important to look after the security and privacy issues that are considered as challenges in this technology. It needs to be assured that the use of such WBSNs does not possess any threats.

If the user is running in the playground and has a heart attack, then the medical team will find his exact location of it and immediately provide him medical facilities. Therefore,

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a new way to find real time location of the user has been discovered in this research work [3].

Data from the user should not be infused into any other data communication received only by a medical center or authorized person. In this regard, the study and implementation of a new technology has been done in this research work.

The latest new technology is used by hackers on daily basis for theft and distortion of data. Therefore, in maintaining the accuracy and completeness of the data throughout communication, a new security technique Quantum Cryptography has been used in this research work.

It is necessary to provide treatment to the patient that his disease has been properly diagnosed or not. In this research work, pulse rate, heart rate, breathing speed etc, are properly measured and then sent to the medical center for primary treatment.

Research Gap

There have been some significant gaps which have been identified during the proposed research of WBSN which are discussed below:

1. Accurate tracking of WBD: Accurate tracking of wireless body device is sometimes not very easy task. This may be due to the limited tracking capacity techniques available or due to the critical physical location of the patient. If the patient moves to a location where the network is unavailable, then it may be difficult to track the body devices that are placed or implanted on the human body. So, In this research work, To get rid of this problem, the real time

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coordinates, latitudes, longitudes of the user have been used.

2. Authentication Problem: In WSNs, broadcast transmission is widely used along with the maximum usage of wireless network and their applications. Hence, there arises a problem of authentication of broadcast messages from source to its destination. Security services are vital for ensuring the integrity, confidentiality and authenticity of user's critical information. So a new biometric authentic technique has been used to resolve this problem. Data in this technique only permitted to transmits after the user is biometric authenticated by a biometric device.
3. Ineffective Encryption Technique: The data and information collected by the Wireless sensors are being sent to a central station or base station. This information is not transmitted directly in its raw form but is encrypted in order to make it secure. This is to make sure that anyone except the authorized individual is not allowed to access the information. The encryption technique is not effective as of now. Many vulnerable cyber attacks are possible. Thus, there is an issue and gap related to the technique used for encrypting the information and there always remains a risk of data or information being leaked.

Proposed Methodology

Body sensor network is a wireless computer device worn on a human body. These sensors are deployed to manage and diagnose the changes happening on the human body through Computer Medical Center. WBSN consists of multiple sensors nodes and every sensors is capable itself for observation, processing and communication of human body's changes like breathing speed, sweating, pulse rate, heart rate etc. with environmental changes like location of patient temperature, humidity, sun light intensity

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etc. to it concern medical center. These sensors are arranged in a cooperative network and they are small, in built power facility and programmed. These sensor devices are implanted in the human body in two ways inner and outward. These sensors must be assessed by different time periods of various parameters of health. If the patient is suffering from a serious illness, then he has to stay in the hospital for a long time and get treatment for his disease and the various symptoms of the patient's body are examined by the medical team. After the medical consultation with the help of the WBSN, the patient can remain in the home under the monitoring of the medical team.

In this research work, first of all the registered user will have to login through the biometric system to access the health care application. After logging in, the sensors become active and the data based on the various and pre determines parameters of the human body, starts sending of data to the medical center through the communication channel.

Advanced Technologies with Telemedicine towards Medical Applications of IoT

Telemedicine services, provided through telephone, may be provided when patients consult with their primary care physicians regarding non-emergency medical concerns. Consultation does not replace consultation, but rather serves to supplement it. Currently, telemedicine is still only making it easier for patients and practitioners to get medical advice and treatment. Because it takes longer to wait for a doctor's visit, it is considerably cheaper to get medical treatment in-office rather than in a clinic or hospital.

It can concentrate on high-priority phone calls since the office is closed. The treatment and prevention of long-term conditions, such as diabetes, high cholesterol, and high

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blood pressure, are a crucial part of following up patients with chronic diseases. But those with this extra help have to arrange their doses, create a diet, have their medicines replenished, or join a support group [4, 5].

Wireless sensor network in Medical Sector

Telemedicine refers to the integration of information technology and telecommunication for the delivery of medical and health services at remote end without any issues of physical presence of the medical experts. Now days, the industry of telemedicine is escalating a lot with the growth of technology based products, services and Internet of Things (IoT) based devices. With the increase usage of IoT integrated medical devices, the dissemination and implementation of health, diagnostic and remedial services are quite effectual. In this manuscript, the assorted dimensions of telemedicine with the market evaluation and research analytics are presented effectively so that the cumulative performance of telemedicine can be integrated [6, 7].

From a last decade, the use of information and communication technology (ICT) is increasing a lot in all the segments including health and medicine industry [8]. Assorted medical services including Telecardiology, ECG Teletransmission, Telepsychiatry, Teleradiology, Telepathology, Teledentistry, Teleaudiology, Teledermitology, Teleophthalmology and many others are now implemented with high performance and more accuracy aware output in different countries [9].

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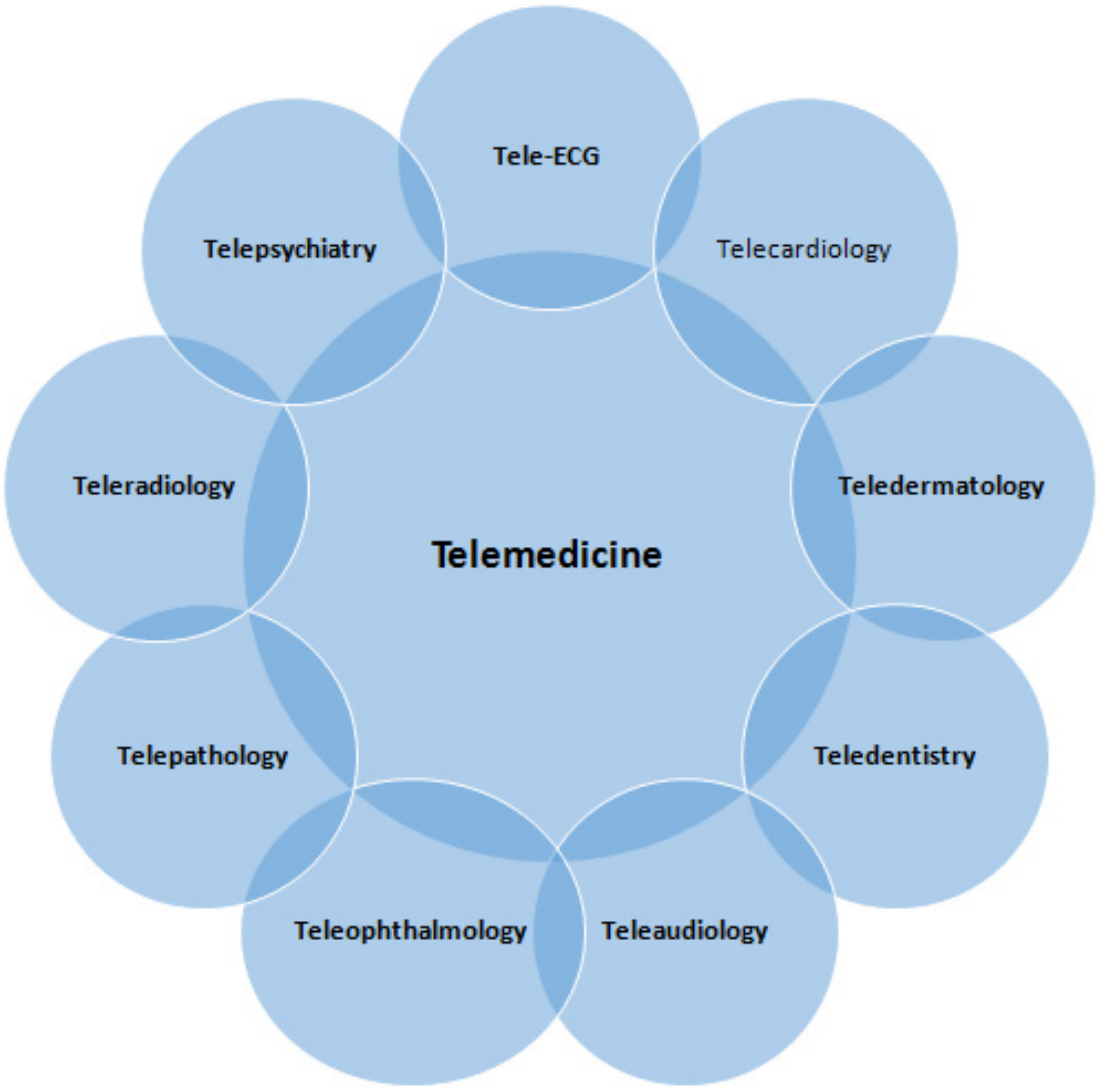

Figure 1 : Assorted Segments and Dimensions of Telemedicine

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As depicted in following cited figure, the global telemedicine market is predicted to have growth towards 40 billion dollars by year 2021 including the contributions by the developing countries.

A related term Tele-Health is associated with Tele-Medicine but that is having a different perspective [3]. Telehealth is more focused on the delivery of medical education and consultancy using video-conferencing and similar platforms. In telehealth, the prior warning or alert integration is done so that the effective and useful information to the target patient can be delivered without delay. There are so many factors by which the use of telemedicine is necessary because of the old age people in the countries. In Singapore, there will be more than 25% population above 65 years by year 2030. This figure was 13% earlier. Now, the treatment and well care of such citizens are necessary [10, 11].

Implementation Perspectives

In this research study, in order to collect the patient's data, firstly there is a need of biometric login. Further processing will only be done only if the login is successful. The login is an optional part but it is necessary in order to move further in the processing of data.

If the biometric login is successful, the sensors that are placed on the patient's body or are implanted inside the patient's body will get activated. After activation of these sensors, the process of collecting thedata will begin by these sensors.In the image above, the value of heartbeat rate, body temperature and the pulse rate will be entered. After these values are entered, the message will get triggered.

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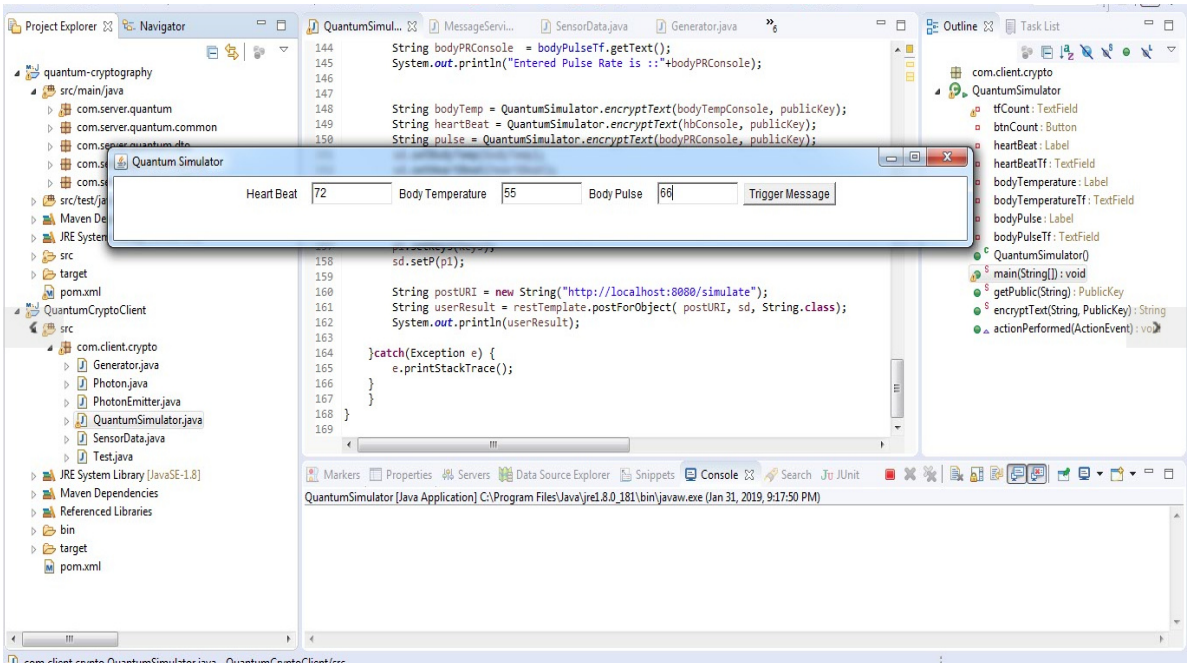

Figure 2 : Simulation Run

The values of data are then entered. In the image shown above, heart beat rate is takes as 72, value of body temperature is 55, and the value entered in body pulse is 66. After this data is entered, the message gets triggered.

Once the message is triggered, the data in the message gets encrypted and is being sent by the sender. This data than moves via quantum communication channel. Once the data reaches the receiver, the message is decrypted by the receiver. Thus, the data is then successfully sent to the receiver.

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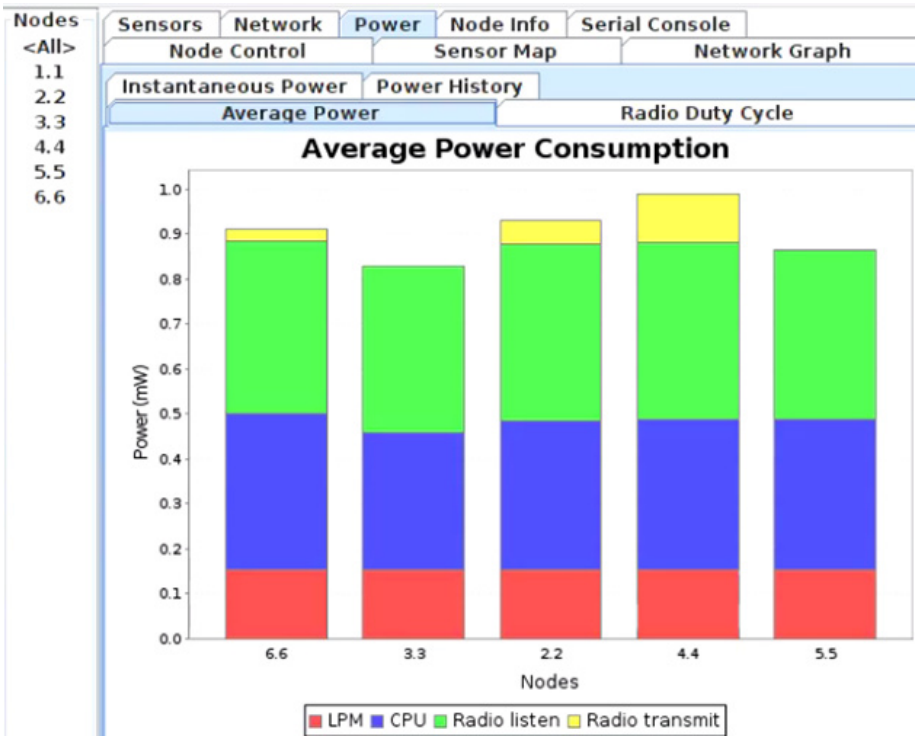

Figure 3 : Analysis of Parameters

The LPM, CPU, Radio Listen and Radio Transmit parameters are analyzed with the power analytics. These values are quite acceptable and effective for the cumulative performance based communication.

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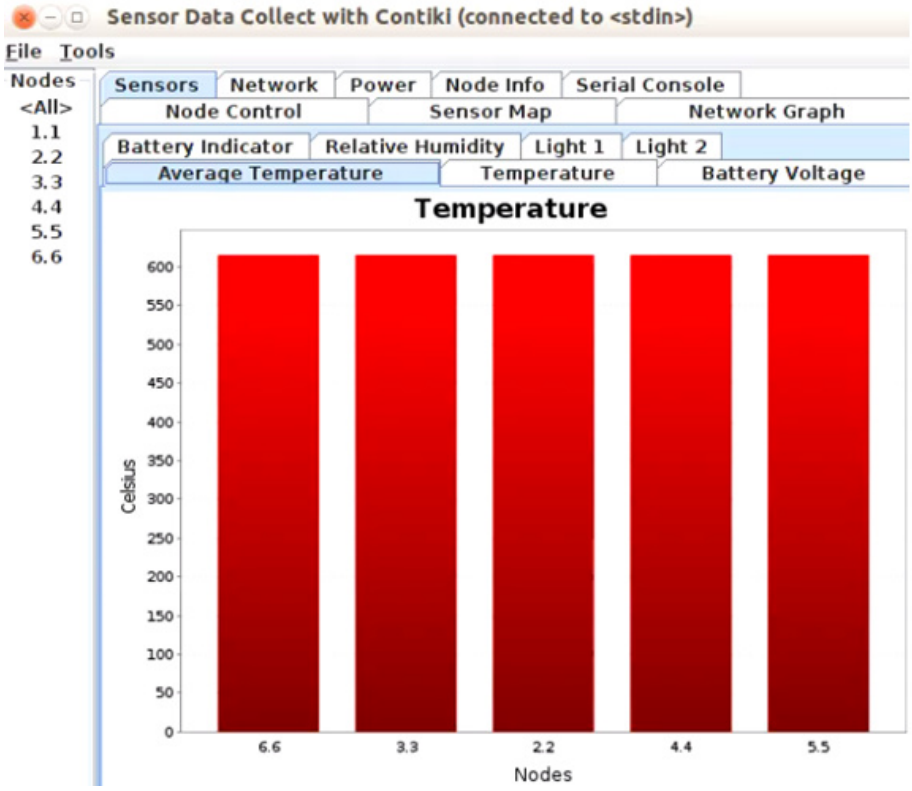

Figure 4 : Analysis of Parameters

The parameter of temperature is associated with power and energy that is required to be in optimal format. This attribute is consistent and giving integrity aware outputs.

Quantum Block #1 inserted in Real Time Quantum Secured Blockchain
Hash Value:
60afeff7f57bc04dc1c411752352363778f661d9088c77d7789b4881a67d46557154ac
Quantum Block #2 inserted in Real Time Quantum Secured Blockchain
Hash Value:
8084d8e09b74235235f295082ea38cc3bbd892f27719b0fa9a732295fac34ed03debb9

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Quantum Block #3 inserted in Real Time Quantum Secured Blockchain
Hash Value:
247086d83f325128210185aed834e1efe218822c6e1223e465321a80d3d78f7ee803
Quantum Block #4 inserted in Real Time Quantum Secured Blockchain
Hash Value:
e7af556dd4792352388f4fb8cfb11f8648e192c8bb66835cdc748b039e0fc5fac646
Quantum Block #5 inserted in Real Time Quantum Secured Blockchain
Hash Value:
439ed447012412f39e44475852dee4d42e4474d535431b61807d02892af38e4a4395e

The log panel is used to gather the findings from both the current and suggested approaches, and then plots of those data are shown using the visual libraries. Based on the findings and diagrams, it seems that the suggested method has far more impact than the conventional way.

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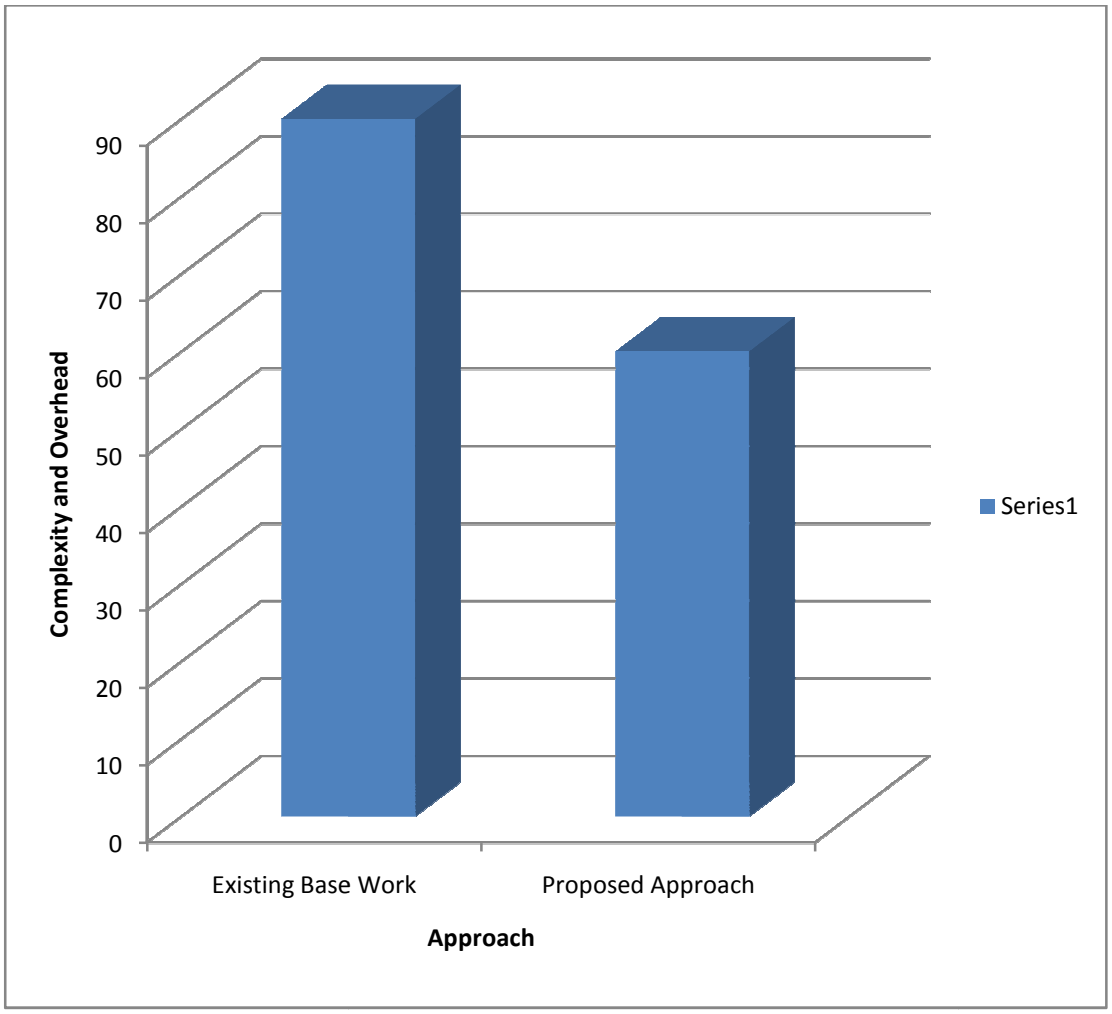

Figure 5 : Analysis of Parameters

The results from existing and proposed approach are collected in the log panel and then plotted with graphical libraries. From the results and plots, it is evident that the proposed approach is quite effective and giving better results as compared to the traditional approach.

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Conclusion

The public-key encryption that is in place today is based on the factoring problem and the elliptic curve discrete logarithm problem. That is, to the extent possible, we are thinking about encryption methods that seem not to be vulnerable to an attacker who has access to a quantum computer. Cryptosystems that are resistant to being cracked by a large-scale quantum computer are being developed. Today, we can measure a million gazillion of health information about ourselves – but we know that it's not so common. In the future, the cloud could send zettabytes of health sensors, wearables, and miniscule medical devices. Like a comparison, the digital information we create and copy yearly in 2013 was 4.4 zettabytes in volume, while the digital universe by 2020 is 44 trillion zettabytes (!). These huge amounts of data, including pieces of health information, will be made sense by quantum computers. In addition, patient monitoring using connected sensory systems could make it useless in physical hospitals – and really help patients. The 'home front' can be guaranteed by quantum computing to run these systems properly.

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