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An Efficient Algorithm for Secure Transmission of Heart Diagnosis Data & Drug Delivery Using WSN

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Abstract: ***With the recent advance in technology, wireless sensors networks (WSN) are now used in medical healthcare application especially in detect human heartbeat. The development of ECG Wireless Sensors for remote monitoring of cardiac activity is one of the most important fields in telemedicine. The monitoring and acquisition of patients' physiological information are quite Crucial for the further treatment. Many patients can benefit from continuous monitoring as a part of a diagnostic procedure, optimal maintenance of a chronic condition or during supervised recovery from an acute event or surgical procedure. However, in most of these researches, tasks like sensor data processing, health state decisions making and emergency messages sending are completed by a remote server. Transmitting and handing with a large scale of data from body sensors consume a lot of communication resource, bring a burden to the remote server and delay the decision time and notification time. Network Security is the most vital component in information security because it is responsible for securing all information passed through networked computers. It refers to all hardware and software functions, characteristics, features, operational procedures, accountability, measures, access control, and administrative and management policy required to provide an acceptable level of protection for Hardware and Software and information in a network. In this paper we propose a new security technique (wavelet) in healthcare applications without considering security makes patient privacy vulnerable based on an advanced Wireless Sensor Network (WSN) due to the required level of trustworthiness and the need to ensure the privacy and security of medical data.***

Index Terms: - WSN, ECG Sensors, Heart Rate, Wavelet, Distributed Operative, PSO.

1. Introduction

There are evidence that the number of people in the world that facing with the heart attack problem had increased. To those who are suffering from this problem may have an attack at any time especially at home without any supervision. Sensor that enables ECG home monitoring to detect heartbeat can reduce this problem. ECG, which is an electrocardiogram, is a recording of the electrical activity of the heart (cardiac) muscle as obtained from the surface of the skin. Current flow in the form of ions in the body and signals contraction of cardiac muscle leading to the heart's pumping action. Skin electrodes that placed on the body collect the signals. Six peaks labelled with alphabet P, Q, R, S, T, and U characterize the normal ECG signal

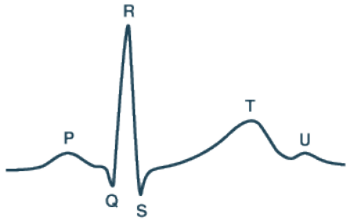

Fig 1: The six peaks from heartbeat signals

Electrocardiogram is also used in investigation of heart disease. If two leads are connected between two points on the body it will form a vector between them. The electrical voltage observed between the two electrodes is given by the dot product of the two vectors. Einthoven's triangle is known as the "three lead" ECG, with measurements taken from three points on the body Research which aims to provide continuous monitoring of patients outside the hospital environment also needs to be developed. The potential applications will save lives, create valuable data for medical research, and cut the cost of medical services. One scenario is the monitoring of people who suffer from heart problems who are left alone at home without any supervision and may suffer an attack anytime. Sensor network, in the form of wireless biomedical sensor network (WBSN), [1] provides the technology that is a potential solution to this problem.

WBSN composed of a number of biomedical sensor nodes and multi-hop networking capability that can be deployed for long term and continuous healthcare monitoring. Physiological signals (ECG, EEG etc) will be measured by the biosensors that provide alerts immediately when abnormalities in a patient's physiological condition are detected. The

wireless link is utilized to fulfil the need for patient mobility in home healthcare and to transmit real-time medical information and warning within an acceptable time limit for critical life cases, especially when more than one sensor are interconnected. Heart rate (HR) is a physiological parameter commonly used by wireless patient monitoring systems. It allows an assessment of the condition of the patient, the cardiac activities can be recorded promptly and variations can be easily differentiated from normal/abnormal. This parameter was frequently used in studies and research projects, providing vital information on the cardiovascular function. Wireless monitoring represents a medical practice that involves remotely monitoring patients who are not at the same location as the health care provider [2]. Generally, a patient have a number of monitoring devices at home, and the results of these devices will be transmitted to the central monitoring station. The homecare monitoring of patients with chronic diseases or elderly also represents an alternative to medical supervision within hospitals [3].

Network Security is a concept to protect network and data transmission over wireless network. Data Security is the main aspect of secure data transmission over unreliable network. Data Security is a challenging issue of data communications today that touches many areas including secure communication channel, strong data encryption technique and trusted third party to maintain the database. The rapid development in information technology, the secure transmission of confidential data herewith gets a great deal of attention. The conventional methods of encryption can only maintain the data security. The information could be accessed by the unauthorized user for malicious purpose. Therefore, it is necessary to apply effective encryption/decryption methods to enhance data security. Network security involves the authorization of access to data in a network, which is controlled by the network administrator. Users choose or are assigned an ID and password or other authenticating information that allows them access to information and programs within their authority. Network security covers a variety of computer networks, both public and private, that are used in everyday jobs conducting transactions and communications among businesses, government agencies and individuals. Networks can be private, such as within a company, and others which might be open to public access. Network security is involved in organizations, enterprises, and other types of institutions. It does as its title explains: It secures the network, as well as protecting and overseeing operations being done. The most common and simple way of protecting a network resource is by assigning it a unique name and a corresponding password [4]. Network security starts with authenticating the user, commonly with a username and a password. Since this requires just one detail authenticating the user name —i.e. the password, which is something the user 'knows'— this is sometimes termed one-factor authentication. With two-factor authentication, something the user 'has' is also used (e.g. a security token or 'dongle', an ATM card, or a mobile phone); and with three-factor authentication, something the user 'is' is also used (e.g. a fingerprint or retinal scan). Once authenticated, a firewall enforces access policies such as what services are allowed to be accessed by the network users [5]. Though effective to prevent unauthorized access, this component may fail to check potentially harmful content such as computer worms or Trojans being transmitted over the network. Anti-virus software or an intrusion prevention system (IPS) helps detect and inhibit the action of such malware. An anomaly-based intrusion detection system may also monitor the network and traffic for unexpected (i.e. suspicious) content or behaviour and other anomalies to protect resources, e.g. from denial of service attacks or an employee accessing files at strange times. Individual events occurring on the network may be logged for audit purposes and for later high-level analysis [6]. Communication between two hosts using a network may be encrypted to maintain privacy.

2. PROBLEM STATEMENT IN ECG DIAGNOSIS

From various artefacts contaminate electrocardiogram (ECG) recording, the most common are power line interference and baseline drift. Power line interference is easily recognizable since the interfering voltage in the ECG may have frequency 50 Hz. The interference may be due to stray effect of the alternating current fields due to loops in the patient's cables. Other causes are loose contacts on the patient's cable as well as dirty electrodes. When the machine or the patient is not properly grounded, power line interference may even completely obscure the ECG waveform. The most common cause of 50 Hz interference is the disconnected electrode resulting in a very strong disturbing signal, and therefore needs quick action. Electromagnetic interference from the power lines also results in poor quality tracings. Electrical equipments such as air conditioner, elevators and X-ray units draw heavy power line current, which induce 50 Hz signals in the input circuits of the ECG machine. Electrical power systems also induce extremely rapid pulse or the spike on the trace, as a result of switching action. Care should be taken to suppress these transients. Figure 2 shows the ECG signal with power line interference. The signal voltages in ECG recording are known to be very small and are in the mill volt range, i.e. they have amplitudes of only a few thousand of a volt. The R wave is the curve segment with the greatest amplitude, i.e. approx. 0.5…4 mV depending on the lead. However, segments with considerably smaller voltages, sometimes within the range of 0.1…0.5 mV, are of greater diagnostic value.If we consider the ratios to all noise fields, we can see that the ratio of the mains voltage (230 V) to the ECG wanted signals is 230 V / 0.1 mV = 2.3 million: 1.This figure cannot be imagined. It would be like trying to find a thick hair measuring 0.1 mm in diameter in a car park 230 meters wide. Only when such parallels are drawn does it become clear just what demands are made on ECG equipment. Fortunately, modern circuiting techniques enable these extremely low voltages to be relatively effortlessly processed. However, the human as the source of ECG voltages also acts as an antenna for most varied of noise fields. The aim of this paper is to describe the types of interference which occur. Their causes will be detailed and advice given how to eliminate them.

2.1. Interfernce in the ECG

The interference which occurs may be divided into five categories:

- AC interference caused by other types of interference

- AC interference due to earth circuit or incorrect earthlings.
- AC interference due to potential differences
- Shaking
- Zero line fluctuations

AC interference is interference which arises from super positioning of the ECG wanted signal with sinusoidal voltages with the mains frequency. It may be recognised by its constant frequency of 50 Hz or 60 Hz depending on the country. Sometimes it can also be 16 2/3 Hz as this is the frequency used by trains. This constant frequency is often only recognised when the ECG recorder has a high rate of paper feed (100 mm/s). In this case, a full wave is approx. 2 mm at 50/60 Hz approx. 6 mm at 16 2/3 Hz. AC interference arises from interference of the mains frequency on the test people, on the electrodes and on the patient cable. Electrode hoses and patient cables normally have such a good shielding that there is little to fear in this respect. Exceptions to this are unshielded electrode cables which in many cases act as an antenna and absorb the interference.

2.2. The Noises in ECG Signal

The common noise sources are Baseline wander and ECG amplitude modulation with respiration, Power line interference, Muscle contraction noise, electrosurgical noise, Motion Artefacts, Noise due to variation of electrode skin contact impedance and Noise generated by electronic devices used in signal processing circuits Power line interference noise is electromagnetic field from the power line which causes 50/60 Hz sinusoidal interference. This noise causes problem in interpreting low amplitude waveform like ECG. Although modern instrumentation amplifiers/differential amplifiers have high common mode Rejection ratio and other measures like shielding and grounding are taken care of while recording ECG, even then the recordings are often contaminated by power line interference. In order to avoid the wrong identification of the characteristics of ECG signals and its impact on analysis and diagnostic accuracy, it is necessary to remove the power-line interference effectively.

3. Proposed Security Technique in WSN Using WAVELET

A wavelet is a mathematical function useful in digital signal processing and image compression. Wavelet transforms and other multi-scale analysis functions [7] have been used for compact signal and image representations in de-noising, compression and feature detection processing problems. Numerous research works have proven that space-frequency and space-scale expansions with this family of analysis functions provided a very efficient framework for signal or image data. . In signal processing, wavelets make it possible to recover weak signals from noise . The wavelet transforms [8] it offers great design flexibility. Basis selection, spatial-frequency tilting, and various wavelet threshold strategies can be optimized for best adaptation to a processing application, data characteristics and feature of interest. Fast implementation of wavelet transforms using a filter-bank framework enable real time processing capability. Instead of trying to replace standard image processing techniques, wavelet transforms offer an efficient representation of the signal, finely tuned to its intrinsic properties. By combining such representations with simple processing techniques in the transform domain, multi-scale analysis can accomplish remarkable performance and efficiency for many image processing problems. Wavelet analysis [9] is an exciting new method for solving difficult problems in mathematics, physics, and engineering, with modern applications as diverse as wave propagation, data compression, signal processing, image processing, pattern recognition, computer graphics, the detection of aircraft and submarines and other medical image technology. Wavelets allow complex information such as music, speech, images and patterns to be decomposed into elementary forms at different positions and scales and subsequently reconstructed with high precision. Signal transmission is based on transmission of a series of numbers. The series representation of a function is important in all types of signal transmission. The wavelet representation of a function is a new technique. Wavelet transform of a function is the improved version of Fourier transform. Fourier transform is a powerful tool for analyzing the components of a stationary signal. But it is failed for analyzing the non stationary signal where as wavelet transform allows the components of a non-stationary signal to be analyzed. The wavelet transform has become a useful computational tool for a variety of signal and image processing applications. The wavelet transform is described an algorithms for processing a signal after its wavelet transform has been computed. Wavelet transform is designed to be easily reversible (invertible); that means the original signal can be easily recovered after it has been transformed. This kind of wavelet transform is used for image compression and cleaning (noise and blur reduction). Typically, the wavelet transform of the image is first computed, the wavelet representation is then modified appropriately, and then the wavelet transform is reversed (inverted) to obtain a new image. Wavelets are a powerful statistical tool which can be used for a wide range of applications, namely : signal processing, data compression, smoothing and image demonising, fingerprint verification, biology for cell membrane recognition, to distinguish the normal from the pathological membranes, DNA analysis, protein analysis, blood-pressure, heart-rate and ECG analyses, Finance (which is more surprising), for detecting the properties of quick variation of values, in internet traffic description, for designing the services size, industrial supervision of gear-wheel, speech recognition, computer graphics, many areas of physics have seen this paradigm shift, including molecular dynamics , astrophysics, optics, turbulence and quantum mechanics. Wavelets have been used successfully in other areas of geophysical study.

4. WAVELET Technique Used For Secured Transmission Of Heart Diagnosis Data.

In healthcare solutions and services will be integrated into image technology process. In the long term, healthcare solutions and services are also likely to be integrated into electronic appliances, machines and information interfaces.

Images are required for substantial storage and transmission resources. So advantage of image compression technique is required to reduce these data. This thesis covers some back ground of wavelet analysis, data compression and how the wavelets have been used for image compression. The threshold is the extremely important influence of compression results to suggest the wavelet technique. As the image compression [10] is that much important one, for that purpose, we will consider an image and assume that the image in a matrix form. As we have to consider the image in matrix of pixel values. In order to compress the image, redundancies [11] must be exploited. For example such exploitations those areas where there is a little change or no change between the pixels are considered as same. Therefore the images having large area of uniform colour will have large redundancies and conversely images that have frequent and large changes in colour will be redundant and hard to compress. The analysis can be used to divide the information of image in to approximation and detail sub signals show the original trend of pixel values. Three detail sub signals show the vertical, horizontal and diagonal details or changing image. If these details are very small then they can be set to zero without significantly changes in the image. If these values are in the threshold, than they can set to zero [12]. Since those values are less that the threshold values then they will become to zero. In this way, if we get a lot of zeros, then we can say that the image is compressed extremely. After the image compression [13-14] is over that the aim is to get or retrieve the image. The process of retrieving decomposes the image from compression is called 're-strained'. If the energy restrained is 100% that the process is called loss less energy re-trained and image is re-constructed exactly. If the image is not decompose totally, than the type of compression is called lose de-compression.
The important technical issues are discussed here.

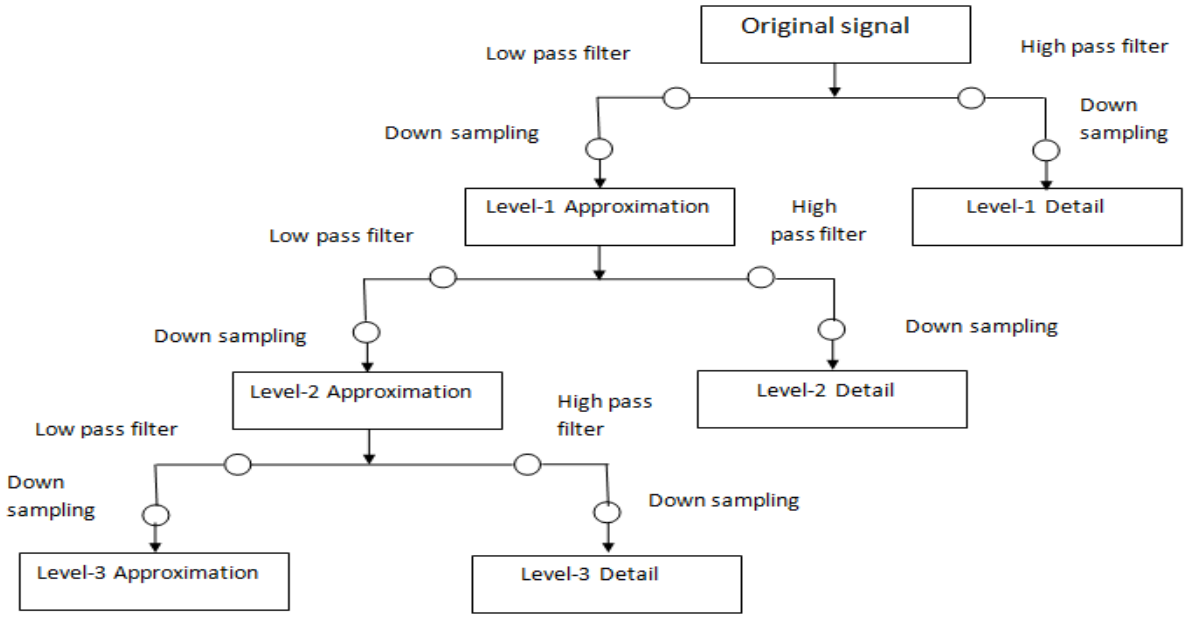

Figure: 2(a)

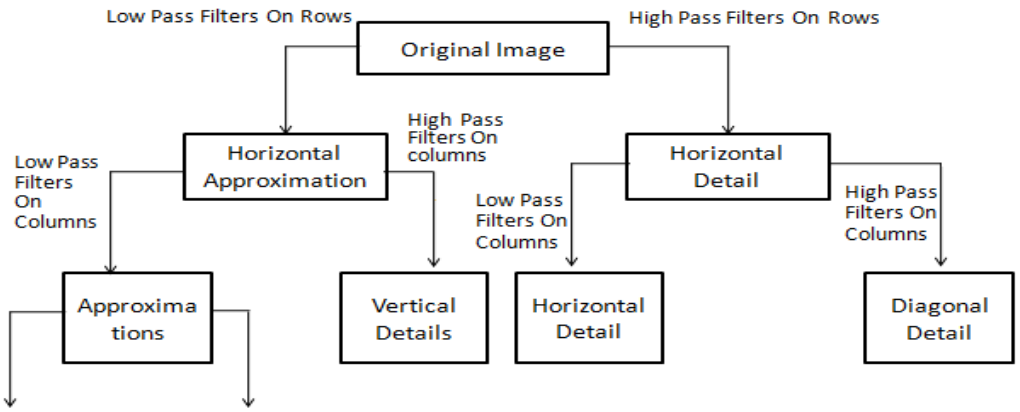

Figure: 2. (b)

Fig: 2. (a) & 2(b). Multi resolution analysis of de-compressing and compressing process by using wavelet Technique.

After Compression, the decompression technique is used to retrieve the information with accuracy and that can be achieved by the intelligent mechanism techniques. Among lot of techniques are available we are going for the particle swarm optimization technique. In this technique we will follow an algorithm [15] for retrieval the exact information. According to that algorithm, it will follow and accurate information can be retrieved easily. There are a number of challenges associated with the long term preservation of digital data. In this paper, we are going to describe how the future desired data are preserved in digital document system. Of most interest to us for this paper are the requirements of future end users of a preserved digital data document. It is crucial when implementing an archival system for the long term preservation of digital data, to consider the end user's needs with respect to the preserved digital document. Such considerations aid in determining exactly what information should be preserved along with the digital document and in what way and we cannot predict everything at the end user. But it may to want to do with a preserved digital document in the future. Which we can assume that they will expect, at least to have the ability to view or interact with the data in the same way as today's users. As such, it is critical that preserved documents can be rendered authentically on future computers. Moreover, the digital document should be interpretable and understandable to future end users as well as remaining usable. As more medical and research institutions come to realize the enormity and complexity of work required to store, preserve, and accurate large amounts of their unique digital information. More over many will turn to establishing cooperative partnerships for leveraging existing mass-storage capacity or utilizing 3rd party data duration service providers to help satisfy their needs for a redundant and secure digital preservation system.

4.1. Searching the Exact Data:

For searching the desired data we have lot of algorithms, but among them they are not showing the exact data whatever we are required. For this purpose in this paper we are proposed a technique to search the data accurately with minimum time with without losing of information. That algorithm is the particle swarm optimization technique. By using this we can change the data from real format to binary format and it will search the desired information. Then it will show us the exact data within less time without losing the information. PSO is a population-based optimization technique developed by Kennedy and Eberhart (1995) and Shi and Eberhart (1998) [16]. It is initialized with a population of random solutions. The algorithm searches for optima satisfying some performance index over generation. It uses the number of agents that constitutes a swarm moving around in the search space looking for best solution. The PSO technique can generate high quality of optimization solution within a short computation time and exhibits a more stable convergence characteristic than other optimization methods. The PSO contains' individual swarms called 'particles'. Each particle represents a possible solution to a problem with *d*-dimensions and its genotype consists 2**d* parameters. First *d*-parameters represent the 'particle positions' and next *d*-parameters represent velocity components. These parameters move with an adaptable velocity within the search space and retain its own memory with the best position it ever reached. The parameters get changed when moving from present iteration to the next iteration. At every iteration, the fitness function as a quality measure is calculated by using its position vector. Each particle keeps track of its own position, which is associated with the best fitness which has achieved so far. The best position obtained so far for particle *i* keeps the track. A large inertia weight (*w*) (Fig.3) facilitates a global search while a small inertia weight facilitates a local search. By linearly decreasing the inertia weight from a relatively large value to a small value through the course of the PSO run gives the best PSO performance compared with fixed inertia weight settings.

4.2. Image Search Algorithm by Using Distributive Co-Operative Technique

A distributed system is one in which the processors are less strongly connected. A typical distributed system consists of many independent computers in the same room, attached via network connections. Such an arrangement is often called a cluster [17-18]. A distributed algorithm is an algorithm designed to run on computer Hardware constructed from interconnected processors. Distributed algorithms are used in many variety application areas of distributed computing, such as telecommunications, scientific computing, distributed information processing and real-time process control [19-20]. Standard problems solved by distributed algorithm are included leader election, consensus, and distributed search, spanning tree generation, mutual exclusion & resource allocation. Distributed algorithms are typically executed concurrently with separate parts of the algorithm being run simultaneously on independent processors & having limited information about what the other parts of the algorithm are doing. One of the major challenges in developing and implementing distributed algorithm is successfully coordinating the independent part of the algorithm in the face of processor failure and unreliable communications links. The choice of appropriate distributed algorithm to solve a problem depends both on the characteristics of the problem and the system. The algorithm will run in such a manner that the probability or link wills not failure. The kind of inter-process communication can be performed with help of the level of timing synchronization between separate processors. The distributed object-oriented paradigm helps the designer to master the complexity of cooperative systems. To specify a distributed algorithm, we observe it from three points of view: the group of objects (a set of distributed entities involved in a distributed computation), objects (a local entity), and their methods (an action that can be performed). In our methodology we define an abstract machine specification as an equivalent state/transition model. A state is mainly characterized by its assertion definition. Such an assertion is first expressed using classical logic operators applied to methods on remote or local objects. We add other logic operators to include parallel and distributed features. They allow expressing knowledge and belief predicates. For the final implementation step these operators are realized by particular method calls. Finally a state predicate is verified if it takes a value in a defined set of possible values. A transition is associated with an action to be performed. In fact we use condition / action systems. An enabling condition for a transition is checked and, only if it is true, the corresponding

action is executed. Refinement transforms step by step an abstract model (in the remaining of the paper we use invariably the terms specification and model) of a software system into an executable code. It must be emphasized that, by our different refinement steps, each model inherits the behavioural and knowledge aspects from higher levels. For instance, when a knowledge predicate is used in a group specification, the corresponding knowledge predicate will be found in the object specification level (for instance by the way of Boolean local variables). A distributed system is an interconnected collection of Autonomous process. Such as: Information exchange (WAN), resource sharing (LAN), Multicourse programming, Parallelization to increase performance etc. Replication is increase reliability and, modularity is improved to design system easily. The configuration of a distributed algorithm is composed from the states as its processes and the messages in its channels. A transition is associated to an event at one of its processes. A process can perform internal, send and receive events. So a process is an internal or send event. An algorithm is centralized if there is exactly one initiator. A decentralized algorithm can have multiple initiators. To search any picture we have to use the Thumbnail of the Image as a query, because Thumbnail of any Images is parts of the picture regardless whatever the background. By using one universal Image search algorithm that can capable to represent the features of any multimedia data type for solving the problems. We will use the contents of the Picture as our index key which uses a K-Tree [21]. A directed graph, containing 2^k incoming nodes and one outgoing node have some benefits for the degree of K is affected by the complexity of the data-structure. For another data type we will reuse an algorithms particular feature. Secondly the Information's stored at the higher level of the tree are the lower amount of the feature to describe the global Information. On the other hand the higher Information and the features are stored at the lower level of the tree. Therefore the user's requirements can be adapted between the time and the accuracy by selecting appropriate level of the tree. Thirdly the features of K-Tree are independent, so the position of the nodes in the tree is same. The problem of inconsistent index structure occurs when a multiple-feature query comes. If the indices of different structures or different data types are processed individually, the database join operation is needed to merge results from each individual index and filters that do not comply with the temporal or spatial constraints. By using the K-Tree to search every feature altogether takes shorter computing time than using feature-dependent structure to search on many indices individually, then merge all results and filters them with spatial constraints.

4.3. Generalized Retrieval Model

The *k*-tree structure is used to retain location information and also a histogram is used to store the characteristics of each portion of the data that corresponds to a part of the tree. This generalized model is depicted in Figure 4.First, either general mathematical models, or special methods, extract the feature of interest. Second, the domain of data type is reduced into a set and each item in the database is also mapped to the set. Third, virtual data values are added to data items, if necessary, to create such that each item will generate a balanced *k*-tree. A *k*-tree is built using histogram values for each feature.

4.4. Binary Pso Based Serching Algorithm

Binary PSO based multi-objective Rule Selection Algorithm to perform multi-objective rule selection; we have already extracted N classification rules in the rule discovery phase of classification rule mining. These N rules are used as candidate rules in the rule selection phase. Let S be a subset of the N candidate rules (i.e. S is a classifier). A binary string of length N represent S, where "1" means the inclusion in S and "0" means the exclusion from S of the corresponding candidate rule. We use binary MOPSO to search for pare to optimal rule sets of the following three-objective rule selection problem.

Maximize f1(S)

Where f1(S) is the number of correctly Classified training patterns by S,

Minimize f2(S)

Where f2(S) is the number of selected rules in S,

Minimize f3(S)

Where f3(S) is the total number of antecedent condition over selected rules in S.

The first objective is maximized while the second and third objectives are minimized.

The third objective can be viewed as the minimization of the total rule length since the number of antecedent condition of each rule is often reformed to as the rule length.

4.5. Algorithm

Step-1: Initialize the population POP:

Randomly generate Npop binary strings (particles) of length N is (no.of candidate rules extracted in rule Extraction phase)

Step-2: Initialize the position of each particle:

For i=1 to Npop, xt(i)=pop[i]

Step-3: Initialise the velocity of each particle:

For i=1µ Npop, vt[i]=0 / initializing each velocity with single of 0's /

Step-4: Initialise the P best of each particle:

For i=1 to Npop, PBEST[i]=xt[i]

Step-5: Evaluate the fitness of each particle /*compute f1(s), f2(s) & f3(s)

Step-6: Store the position of the particles that represent non-dominated vectors in the reposition REP.
Step-7: WHILE maximum number of cycles has not been reached DO

(a) Compute the best for each particle in the reposition REP applying k-mediod clustering technique on two objective criterions coverage and confidence.
(b) Compute the speed of each particle using the following expression bit wise:
For C=1 to L
vt+1 [i][l] = vt [i] [l]+Rand( ) (PBRST [i] [l]
-xt [i] [()] + Rand (0) (G BEST [i] [l]-xt [i] [()] /x Rand ( ) tables the values in the range (0.1)
(c) Update the new positions of the particles xt+1[i] bitwise: For l=1 to L,Calculate the threshold value
If (rand ( ) < w) then xt+1 [i]- [l]=1
else xt+1,[i]-[l]=0
(d) Evaluate the fitness of each of the new particles in pop
(e) Update the p best of each particle.
(f) Update the contents of reposition REP by inserting all the currently non-dominated particles into the reposition. Any dominated totaling from the reposition are eliminated in the process, since the size of the reposition is limited, wherever it gets full, a secondary criterions for refection known as crowding distance technique is applied. The final result of PSO-based multi objective rule selection (all the final non-dominated particle in the reporting) is not a single rule set but a number of non-dominated rule sets with respect to the three objectives in (7). This is the main characteristic feature of PSO-based multi-objective rule selection.

4.6. Algorithm

Virtual Node

The Virtual-Node (VN) in-picture search algorithm

Case A) if query's tree aligns within the k-tree structure of data:
1. Find the distances between feature in root of the query tree and nodes of the data at level Li-1 – nodes with solid-line link – of the stored item. If distances are equal to the distance between the query and their parents, the query could be found within those child nodes.
2 Repeat
Case A) Recursively on this child node. If there is no distance at level Li-1 close to the distance to the parent, the query is "not aligned". Follow Case B below.
Case B) if the query data falls in between two or more nodes:
1. If no node in *k*-tree can be a candidate, Virtual nodes (white nodes) between two nodes have to be generated from the parts of their child nodes.
2. Repeat the whole algorithm into a new tree; use the whole algorithm within the dashed box.
Case C) If height of query is equal to a node height:
1 Use histogram distance function to calculate the distance then
2 Return the distance and location.

4.7. Picture Search Algorithm (Generalized Virtual Node)

Extended_Query=Add_Dummies (Query)
Feature_Of_Extended_Query = Feature_Extraction (Extended_Query)
VirtualNodeComparison (Feature_Of_Extended_Query,
Feature_Of_Extended_Data, ROOT, distance,
Tentative_Location*)*
IF (distance < threshold) THEN BEGIN
Find "Query_Representative," the largest node in the k-tree of feature_Of_Query, where no parts of dummies are included.
Virtual Node Comparison *(*Query Representative, Feature_Of_Extended_Data,
Tentative _Location, distance1,
Tentative_Location1*)*
IF (distance1 < threshold1) THEN BEGIN
Find the final distance by calculating the distance between the query and area of data where the beginning of the area is at Tentative_Location1**.**
Distance = distance1
Location = Tentative_Location1
RETURN
END
END

5. Conclusion & Future Direction

The monitoring and acquisition of patients' physiological information are quite crucial for the further treatment. We have developed some algorithms for secured transmission of the diagnosis data. In the algorithm, the objective function, and the error signal as presented give us a structured and simple way to interpret, analyze, and study. As Network Security is

the most vital component in information security because it is responsible for securing all information passed through networked computers. It consists of the provisions made in an underlying computer network infrastructure, policies adopted by the network administrator to protect the network and the network-accessible resources from unauthorized access, and consistent and continuous monitoring and measurement of its effectiveness combined together. We have studied various algorithm techniques to increase the security of network. Looking into the future, the tussle between trustworthiness and privacy and the ability to deploy large-scale systems that meet the applications' requirements even when deployed and operated in unsupervised environments is going to determine the extent that wireless sensor networks will be successfully integrated in healthcare practice and research.

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