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A Survey on Medical Data Compression and Transmission in Wireless Ad Hoc Networks

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ABSTRACT: A type of wireless network called as ad hoc wireless networks which are deployed in disaster areas so as to collect data of patients and also to improve medical facilities. There are several nodes which are scattered in the disaster area for WANET and also capable of sending collected medical data to base stations. The transmission of huge medical data and limited battery power of the nodes will require an energy efficient approach and also to maintain the quality of service, an optimization based technique is proposed. The technique will be robust to transmission errors. This is a fully distributed technique, which does not use any geographical or location information. The advantage of the proposed work is having prolonged network lifetime and effectively maintains the connectivity of WANETS. In this paper battery lifetime of the network is increased by considering the battery levels of the nodes. Rivest cipher4 encryption algorithm is been used for getting strong encryption and also an anlaysis tool is used which will give the R,G,B based analysis of the image size before and also after compression.

KEYWORDS: Wireless ad hoc network, health care, transmission error, WANET, disaster area.

I. INTRODUCTION

Remote Medical Monitoring is a telemedicine application which is a remote station that is based on the primary health care system. The system will collect the medical data of patients (MDPs) such as x-ray images, endoscopic images, mri scan images etc. This is done at the primary health care centre (PHC) of the deployed area and the medical data of patients is transmitted to the community care (CC) via wireless networks. CC Centre is the place where health care center or hospital in which all the medical facilities and doctors are available. A WANET has several nodes that will communicate with each other or communicate with PHC station of disaster area or can communicate with CC center. If all the nodes in the disaster area can reach the CC center in more than one hops, the WANET can be said to be connected. Minimal Energy consumption and also ensuring the connectivity of the network for extension of the lifetime of WANETs. Since, the batteries powering the nodes cannot be replaced often. In this paper, an energy-efficient connectivity problem is studied here. Assuming that scattered nodes that are deployed in the disaster area are independent. The network lifetime of the nodes deployed in disaster area is increased by using a visually lossless compression technique for MDPs. The transmission of compressed MDPs from the PHC station is done by the fuzzy logic route-selection technique. Reduction in the size of MDPs can be achieved by using medical data compression technique and hence transmission is made faster. The compression and decompression of MDPs is done at PHC station and at CC center also. In the presence of transmission errors also, robustness is achieved. The problems in routing the MDPs are network reliability, low routing delay, long battery time. The proposed system will collect medical data of patients by the remote medical monitoring system in the form of images at the primary health care station of deployed area and also transmitting the medical data of patients to the community care centre through ad hoc wireless networks. Characteristics of WANET includes the frequent occurrence of transmission errors and also battery lifetime is limited.
A compression process and noisy channels [6]introduce lossless transmission of MDPs without any perceptual distortion. Mis-Diagnosis may occur due to the perceptual distortions. Medical Image transmission mainly uses the lossless compression techniques. These techniques will be having a higher bit rate. Medical data transmission applications has widely accepted the visually lossless compression techniques. The medical data compression technique mainly aims on highly compressed MDPs without considering the perceptual quality and is robust to the transmission errors. The proposed work shows the MDPs in the form of color images such as endoscopic images and black and

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white images such as x-ray images also. MDC and FRS techniques are integrated together to for WANETs to form the Remote Medical Monitoring system. The input raw endoscopic image is taken and then performs color space conversion. By using IntDCT it is converted to AC and DC coefficients. DC coefficients are differentially encoded and AC coefficients are encoded using zigzag scanning. Then AGR encoding technique is used. Finally, the output compressed endoscopic image is achieved. The advantage of MDC and FRS technique is that the consumption of energy is less and during transmission of compressed data from PHC station to the CC center reduces packet loss. The issues related to the routing of compressed MDPs can be solved using the technique known as FRS technique. An effective route selection technique is estimated by the FRS technique for routing from the PHC station to the community care centre. The compression process can be divided into two stages. They are image transformation and encoding of coefficients. The Decompressed MDPs are filtered using an adaptive edge based filter which will reduce the artifacts and noises.

II. RELATED WORK

K.Shimzau et.al [1] has proposed about the national crises that was raised due to the earthquakes and also caused tsunamis. Through these experiences in this paper it was established even though advanced communication systems and advanced disaster medical response systems. However, Japan was ruined by the Great East Japan Earthquake which has occurred on March 11th, 2011. Huge tsunamis swept a vast area of Tohoku causing complete breakdown of all infrastructures which includes telecommunications. Emergency information communication was limited and also caused a serious delay in the initial rescue and medical operation. In case of emergency rescue and medical operations, it is very important to identify the number of casualties, locations and states and to dispatch doctors and also rescue workers from various organizations. In the case of the Tohoku earthquake, the dispatching mechanism or decision support system did not exist to allocate the appropriate number of doctors and locate disaster victims. Though the doctors, rescue workers from multiple government organizations having their own dedicated communication system, the systems were not operable. In the area of the disaster management, there is an urgent need for introduction of cutting edge ICT. In this, a concept of Emergency Temporal Information Network System that is designed in a system of systems which is in the Acute Stage of Large-scale Disasters Damage Mitigation.

J .J. Ding et.al [2]has proposed about the In the conventional JPEG algorithm, in which an image is divided into eight by eight blocks and the 2-D DCT is applied to encode each block. In this paper, in addition to the rectangular blocks, the 2-D DCT is orthogonal in the trapezoid and triangular blocks also. Therefore, instead of eight by eight blocks, generalize the JPEG algorithm and divide an image into trapezoid and triangular blocks according to the shapes of objects and achieve higher compression ratio. Comparing with the existing shape adaptive compression algorithms, which does not match the shape of each object exactly, number of bytes that is used for encoding the edges can be less and the error caused from the high frequency component at the boundary can be avoided. When the bit rate is fixed, proposed algorithm can achieve higher PSNR than the JPEG algorithm and other shape adaptive algorithms. Furthermore, in addition to the 2-D DCT, the proposed method can also be used to generate the 2-D complete and orthogonal sine basis, Hartley basis, Walsh basis, and discrete polynomial basis in a trapezoid or a triangular block.

G. Varaprasad et.al[3] in his paper has proposed about the mobile ad hoc network which is a dynamic wireless network, without having fixed infrastructure. In this, a new multicast algorithm is proposed to increase the lifetime of node and also network in the mobile ad hoc network. Considering two metrics, namely residua lbattery-capacity of the node and the relay capacity of the node to do multicasting from the source to a group of destination nodes. The proposed method is simulated using the network simulator-2.33 and it is tested under various conditions. The proposed model is compared with the existing algorithms such as multicast-incremental-power, lifetime-aware-multicast tree, multicast-ad-hoc-on-demand-distance-vector protocol and also multiple-path-multicast-ad-hoc on-demand vector. The proposed method shows the best results in terms of the node lifetime, network lifetime and also the throughput. One of the main design contains in the MANET is that the mobile nodes are energy constrained. The multicast algorithm are developed to reduce the energy consumption of all nodes in the network. The proposed model has differed from the existing algorithms. It is addressed with few limitations against the power-aware metrics in the multicast algorithms. It is also argued that the proposed algorithm exhibits more lifetime of the node and network, throughput as compared to others. The simulation results reported in this paper demonstrate that the proposed model improved the network lifetime by

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20% on average. Extending network lifetime is accomplished by finding multicast that tends to minimize the variation of remaining energy of all the nodes. The power-aware multicast protocols tend to create additional control traffics. The basic mechanism in this work is highly extensible and supports QoS for the MANETs. In this work, it does not considered packet loss but in real situation, there is a packet loss.

P. Turzca et.al[4] in his paper has proposed about the design of a hardware-efficient, low-power image processing system for next-generation wireless endoscopy. The proposed system is composed of a custom CMOS image sensor, a dedicated image compressor, and also a forward error correction (FEC) encoder which protects radio transmitted data against random and burst errors, a radio data transmitter, and a controller supervising all operations of the system. The most important part of the system is the image compressor. It is based on an integer version of a discrete cosine transform, low complexity yet efficient, entropy encoder making use of an adaptive Golomb-Rice algorithm instead of Huffman tables. The hardware-efficient architecture that is designed for the proposed system enabling on-the-fly compression of the acquired image. Instant compression, along with elimination of the necessity of retransmitting erroneously received data by their prior FEC encoding, reduces the size of the required memory in comparison to previous systems. The proposed system was prototyped in a single, low-power, 65-nm field programmable gate arrays (FPGA) chip. The low and comparable power consumption to other application-specific-integrated-circuits-based systems, despite FPGA-based implementation.

B.Fong et.al [5] in his paper has proposed about the Prognostics and health management has been used in predicting the time at which a system will not perform its intended function. The proposed system aims at providing a reliability optimization for wireless telemedicine networks by using the prognostics approach. The science of prognostics, based on analysis of failure modes, detection of early signs of wear and aging, and fault conditions, has been applied to electronic components and systems as well as structural monitoring. Using data-driven prognostics techniques, the condition of a network can also be monitored using operational data related to data packets as they are delivered across the network. Prognostics are particularly important for wireless telemedicine networks since these networks must operate reliably irrespective of abruptly changing operating conditions in order to support life-saving missions.
With advances in multimedia technology, more life-saving telemedicine applications with very stringent reliability requirements have been deployed in different areas of the world wherethe operating environments can vary significantly. Network reliability has very significant implications on these systems operation. Though understanding of various major factors that affect the reliability of wireless communication networks, various PHM techniques can be applied to wireless communication networks in response to factors that affect the reliability. Important parameters such as network availability and data throughput can be optimized. One of the major objectives of PHM is condition-based fault management. Detection of a fault is usually accomplished when a certain network performance metric falls below its pre-determined threshold. Fault management entails symptom detection followed by problem isolation. Diagnostics can attempt to fix a problem depending on the nature of the problem. Wireless networks for telemedicine applications requiring at least 99.999 percent availability would need high resolution planning. Prognostics and health management techniques provide a cost-effective solution for the reliability prediction of wireless communication networks through condition-based optimization of various network parameters such as system link margin, dynamic routing, and power control. It is also possible to balance between network performance and reliability through best possible utilization of network resources.
C.E ,Perkins [7] et.al in his paper has proposed about the Ad-hoc On-Demand Distance Vector Routing (AODV) is an on-demand routing protocol for WANETs.
O.Deforges[8] et.al in his paper has present an efficient content-based image coding called locally adaptive resolution (LAR) offering advanced scalability at different semantic levels, i.e., pixel, block, and region.
El Hajj [9] et.al in his paper propose a suite of protocols that achieve a distributed planning and routing scheme for MANETs. The proposed suite, which is composed of three protocols, offers scalability
and extends network lifetime.
G.Schaefer [10] et.al in his paper has proposed about the diabetic retinopathy is the leading cause of blindness in the adult population. Mass-screening efforts, during which high resolution images of the retina are captured, are therefore underway in order to detect the disease in its early stages.
S.Y.Lee[11] et.al in his paper has proposed about the problem of the compression of a video sequence acquired by most inexpensive single sensor video cameras.

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U.Bayazit[12] et.al in his paper has proposed about the adaptive spectral transform for wavelet-based color image compression.

III. PROPOSED SOLUTION

The proposed solution is the Remote Medical Monitoring Technique and also the fuzzy logic route selection technique. These two techniques are integrated together to reduce the size of MDPs and the transmission via ad hoc wireless networks can be made faster. This system collects compresses and also transmits the medical datof patients in a faster manner. The compressed data is transmitted to the base station via WANETs. In the presence of the transmission errors also the system allows to decode correctly. To maintain the quality of service of WANETS, RMM system exploits the attributes of WANETs. Due to the routing of the compressed MDPs the lifetime of the network has been increased to a greater extent. The Quality of service of WANETs is maintained here. The advantages of this system are visual quality of the MDPs, compression ratio and also the robustness against the errors. The energy consumption, lifetime of the network, delivery ratio of the MDPs can be increased using the remote medical monitoring technique and also the FRS technique .
The FRS technique mainly aims to find a better route selection metric which will enhance the lifetime of the network. The MDC technique can be divided into four blocks. They are medical image preprocessing, medical image compression , sequence transmission, and also routing. Medical image preprocessing consist of the steps such as grayscale conversion and the image matrix calculation. Then comes the medical image compression. Medical image compression followed by the processes such as Image transformation, encoding coefficients, reduction of noises, color space conversion, DCT calculation, Quantization .Next block is the sequence transmission. Sequence transmission consists of encryption, tcp communication and decryption . Next block is the Routing.The Routing block consists of processes such as fuzzy routing and the network monitoring also. These are the main components of the Remote Medical Monitoring System.

The Technique has advantages such as that
1) It has an analysis tool which is known as the histograms based analysing tool.The comparison done is R,G,B comparison. Variation is based on the histogram.
2) Battery Constraints:

i) If the battery level is less than 40, the file will not be sent.

ii) If the battery level is between 40-60, the socket communication will be used.

iii) If the battery level is above 60, get ip and the file is sent.

3) Rivest cipher 4 encryption algorithm is being used for the encryption and the decryption in the above said technique.
In this paper, the proposed system is for the routing of medical data of patients in disaster areas. The proposed system consists of components that collects, compresses and also transmits compressed data to base station via wireless ad hoc network.It can decode correctly even in the presence of transmission errors. This system exploits attributes of quality of service. Simulation and demonstration of the system for different scenario and demonstrated lifetime of network is increased. Thus it maintains QoS of WANETS. In future hardware implementations will be made.

IV. CONCLUSION

In this paper, we have gone through a survey of medical data compression and transmission in wireless ad hoc wireless networks. The main limitation is low routing delay, network reliability and long battery life. Remote medical monitoring is the system which collects compresses and transmits medical data of patients via wireless ad hoc networks. A fuzzy logic route selection technique is also used to deliver the compressed data that will maximize the lifetime of WANETs. These two techniques are integrated together for the faster transmission of medical data of the patients from the PHC station to the CC Center via wireless networks .

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BIOGRAPHY

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