

Treatment and Prevention of Diseases by Monitoring and Multi-Description Video Streaming In Wireless Multi-Hop Networks

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ABSTRACT

In Biomedical Research for the persons who were suffering from cardiovascular diseases and who are living away from the hospitals, it is essential to monitor their health condition (electrocardiogram (ECG)), In such a manner so as to achieve a desire result of preventing and controlling their abnormal condition and to provide an instant treatment for the patients when an untypical variation of HEART RATE (HR) occurs. The patient contains a device (mobile care device) which is capable of capturing the physiological condition of the patients by sensing and wirelessly sending the patients ECG data That is in the charge of sending the data in multiple paths ,where the paths are established by using Split Multipath Multimedia Dynamic Source Routing (SMMDSR) protocol (Gomathi, 2012). (Teo, 2008). Thus the ECG data can be efficiently (Lai, 2009; Lee, 2009) delivered from the patient to the health care services through multiple paths in order to meet the health care QOS(quality of service) and end-to-end ECG delivery. Apart from sending the ECG data to the health care services. In this paper the physiological monitoring system is based upon video recording instantly and sending through multiple-description video streaming (Zhou, 2008) in wireless multi-hop networks which can continuously monitor the patients abnormal condition at any time or any place without any distortion due to the extended communication (Rudlovic, 2007) coverage by installation of camera and multiple descriptions video streaming in wireless multi-hop networks. The analysis of multiple description video streaming (Zhou, 2008) through wireless multi-hop networks is to consider that the foremost 'I'-frames are sent in the main path that has the minimum distortion rate and then 'P' and 'B' frames (Lee, 2009) are sent in the deputy paths and then trade-off to the next path for the successful video transmission in time.

KEY WORDS: Multiple description (MDC), End-to-end delay, Peak signal, noise ratio (PSNR), Electrocardiogram (ECG), multipath.

1. INTRODUCTION

Now-a-days health care services are necessary to provide, continuously to the elderly people, who are living away from the health care services or living alone suffering from diseases like Hypertrophic Cardio Myopathy (HCM) (1) HCM is a disease in which the muscles of heart become atypically thick making it rigid for the heart to pump blood, site of coronary artery deviations, long QT syndrome, unexpected fainting, family antiquity of abrupt cardiac death, lack of breath or chest pain may also be a sign that you are at risk of sudden cardiac death. In which people may think as a sign of other health problems like asthma. So there is a necessary of sending the patients ECG conditions continuously to the health care services. By that the health care services can monitor the patient which results in decreasing death rate. In the recent years for mobile-home health care applications, (Lee, 2009) there exists a wireless multi-hop relay networks. (Lee, 2009) Where the ECG data of the patients is delivered to the health care services at any time. Moreover for the reliable delivery, the ECG data (Chien-chih Lai, 2009) is forwarded via wireless relay nodes (Sharma, 2010) to the Remote Gateways (RG).

From RG the data is transferred to the health care services through the internet. In case of emergency alert SMS is sent to the health care services. But it efficiently works only in case of minimum distance from source to destination, because in multi-hop relay network number of hops must be limited to two or three results in increasing delays and also relays helps improve the capacity only by decreasing the distance.

So in this paper we propose a system where the ECG data is sent in multiple paths where the multiple paths are established by using SMMDSR protocol which establishes the multiple paths between two nodes and uses routing messages such as route request (RREQ) and route reply (RREP) which establishes the multiple paths for transmission of video between two nodes (Gomathi, 2012) are selected based on the actual delays, by that the data can be delivered in time to the health care services.

In addition to this, there is no circumscription of minimum hops between sources to destination, so that the rate of capacity doesn't depend upon the distance. The situation can be handled effectively by the installation of the camera which stays beside the patient's bed and continuously monitors patients health condition and sending the report continuously to the health care services. A remote HD IP camera system communicates in real time to the health care services with HD video recording instantly anywhere, anytime no matter where the patient is.

In this paper, we approach MDC through the implementation of the camera which is used for video recording in which MDC is a firm of data partitioning and thus comparable to layer coding (Akyol, 2007) as it is used in MPEG4 and MPEG-2 (MPEG-4) can be used for compression of audio & video data.

For web, for CD distribution as well as voice broadcast television define a groups of I, P, B type (Peng, 2008; Xie, 2014) frames that provide different level of encoding and protection against transmission loses. In case of I-frames the encoding is done independently but not in 'P' and 'B' frames (Peng, 2008; Xie, 2014) as encoding relative to the information encoded within other frames.

In this paper we employ the delivery of patients ECG data through multiple paths to the health care services and physiological monitoring system by video recording instantly and sending through multiple- description video streaming (Zhou, 2008) in wireless multi-hop networks.

System description: In the proposed wireless multi-hop network, it take cares when the patients physiological condition becomes abnormal and unstable, then the ECG condition of the patient will be send in the multiple paths to the health care providers, here the key issue is selecting the multiple paths (the paths selection is based upon the path with least congestion) (Teo, 2008).

And also it uses multi description coding technique. (Akyol, 2007). Initially the video clip is separated into sequence of frames with respect to the quality and groups of such frames, and then at the source node the video is compressed by video encoder into streams. And each stream is assigned to multi path according to the priority of the frame types. Where the foremost I-frame (Peng, 2008; Xie, 2014) is sent in the main path and 'P' and 'B' frames (Peng, 2008; Xie, 2014) are sent in deputy path and trade off to the next optimized path.

The main paths and deputy paths (multiple paths) are selected based upon the actual delays , instead of blindly selecting the paths with minimum hop counts and the multiple paths are established by using SMMDSR protocol (Gomathi:2012). Because always minimum hop counts doesn't guarantee in giving the better time delay.

Camera used: The specified camera used for monitoring the patient's health condition is MD2GO REMOTE HD IP CAMERA with instant alert message sending indulged in technology.

With the camera used the following functions are effectively undertaken: The MD2GO system is responsible for capturing the patient's physiological condition and forwarding the video to the health care services with HD quality better than human naked eye. By this the health care services are capable to visualize the patient condition at any time with real time HD quality.

Information regarding the camera: It is winded up with a 10x HD lens for the purpose of best video quality. The MD2GO system is easy to use. This system gives the instant responses to all your requirements. Thus the health care services can easily access the required images of the patient. This system is less weight, so it can be easily wheeled to anywhere. This system is provided with telescopic pole which can be extended up to 87 inches.



Figure.1. Image of MD2GO



Figure.2. Sony SNC-RH124 IPELA HD

This camera has 5.1 to 51mm Auto focus Lens. It comes with a Zoom capacity of 10x Optical Zoom. Its Video recording capacity is 720p with the recording resolution at 30 fps. It has High-Speed 360° Endless Panning. It can be tilted up above the Horizon 15°. The formats of H.264, MPEG-4 & JPEG are easily compressed. This camera comes with DEPA Advanced Technology. It is considered for its Dynamic Noise Reduction. It filters the sound ambiently and makes the receiver to receive information without any disturbances.

Some Enhanced Functions: An emergency case can be informed instantly. Its ambient sound filter function helps in clear voice transmission. It has Dynamic range compressor. Echoes generated during voice transmission are canceled.

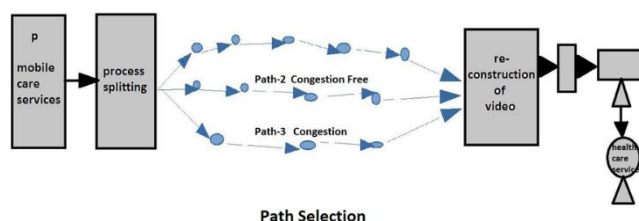
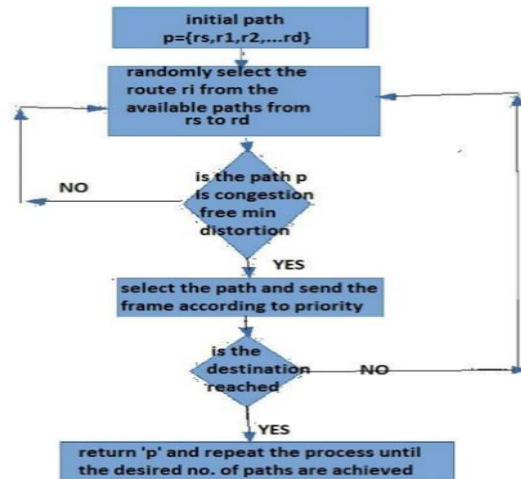


Figure.3. Now the video is sent through the multiple description concept

In the above fig it selects path2 for transmission even it has highest intermediate hops compared to path3 because of congestion. Here MDC initially splits the data into a multiple streams and forwarded in multiple paths based upon the prioritization of frames and actual delay based on congestion instead of selecting the path with

minimum number of hops. And the video will be reconstructed in the receiver side and the quality is comparable with no. of streams received. (Teo, 2008).

Path selection and path scheduling: In the multi path the key issue is selecting the optimal path with least congestion and distortion rate. The earliest frames are sent in the main frame and the leftover frames are sent in the deputy paths. Here the destination node will send the distortion aware information including interference in paths and importance of packets. By these the source node can switch the main path and deputy path to achieve the trade-off between 'I', 'B' & 'P' frames. So these can reduce the distortion of reconstructed video. (Teo, 2008).



Figur.4. Flow chart for multiple paths selection

Mobile care devices: The consumers and the health care service providers using smart phones are growing exponentially throughout last decades. Two-thirds of physicians are utilizing this and it has become rapid. 6.2% of India's overall population owned as smart phone as per 2013 a figure that is raised to almost 20% by 2017.

Based on World Health Organizations statistics and other sources, chronic diseases and physiological pressures are behind the death of 80% of elderly people. The great part of elders suffers from various chronic diseases. We plan to educate on how recent enhancement in wireless networks (Rudlovic, 2007) and smart phone technology.

Provide health observation at home, which is particularly serviceable for patients who were suffering from CVD. Ubiquitous health monitoring is an important predecessor for dissection and identification, as it allows Biomedical Signals to be measured without individual's awareness.

Areas of exploration are ECG signal measurement on bed can be measured by a conductive textile wired up with electrode is attached to the bed sheet is a case, respiratory problems, snoring, and blood-oxygen saturation.

Continuous monitoring as a part of an identification procedure supports primitive detection of antidromic conditions and safeguard of its severe outcomes. Provides administered rehabilitation from a piercing occurrence or operative procedure.

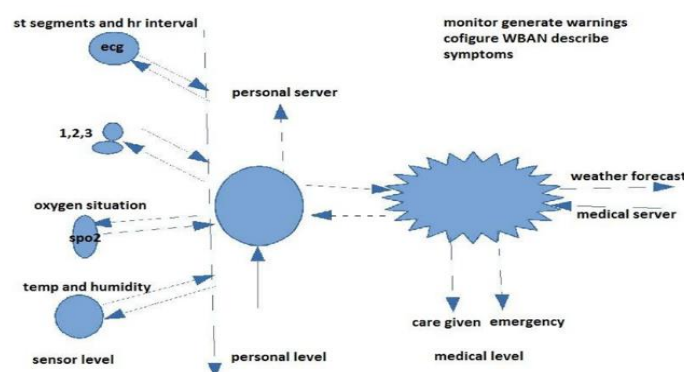


Figure.5. Data Flow in a WBAN

In the diagram 1, 2 & 3 represents motion, sensors, and accelerometers respectively.

Sensor level:

- ECG sensor is used for monitoring the patient's heart activity.
- EMB sensor is used for monitoring muscle activity.
- A blood pressure sensor.
- A tilt sensor for monitoring trunk position movement.
- A "smart sock" sensor or a sensor furnished shoe innersole to outline period of individual steps.
- Sensor is of less weight.

Personal server level: Secure communication with remote healthcare provider servers like,

- Internet enabled PDA.
- Usage of 3G cell phone.
- A home personal computer. (Rudlovic, 2007).

Medical server level:

An emergency service: If the received data is out of range (from normal) or indicate an immediate medical condition.

The exact location of the patient: The personal server is furnished with GPS sensing element observing the exercises of patient:

- By medical professionals.
- Issue altered guidance based on the new information.

2. EXPERIMENTAL RESULTS

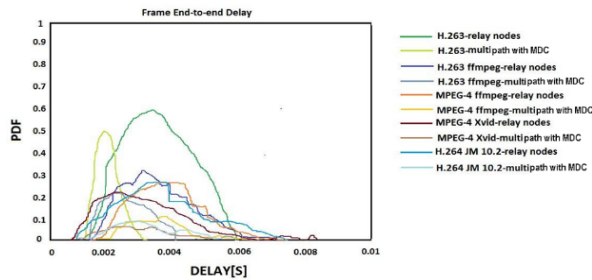
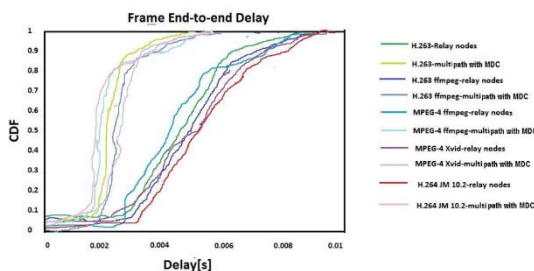


Figure.6. Frame end-to-end delay

H.264 is the codec characterized in Part of MPEG -4 measures, also known as Advanced Video Coding (AVC). (Akyol, 2007) .AVC is one of the common codec format which is mainly used for recoding, compression, and sharing of the High Definition video. H.264 is based on the H.263 codec. Xvid codec is the codec which is used by Xvid file. It's not a video type like MP4, but instead is a type of program that is used to constringe and decompress video to MPEG-4 ASP in order to store on disk space and file convey speeds.



Figurer.6. Frame end-to-end delay

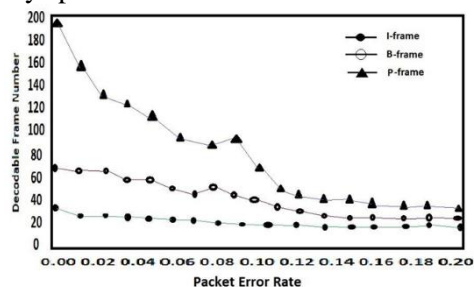


Figure.7. Comparison of frames

From the above figure it justifies that the foremost 'I' frames are sent in main path which has least congestion rate results in minimum packet error rate as compare to 'P' and 'B' frames.

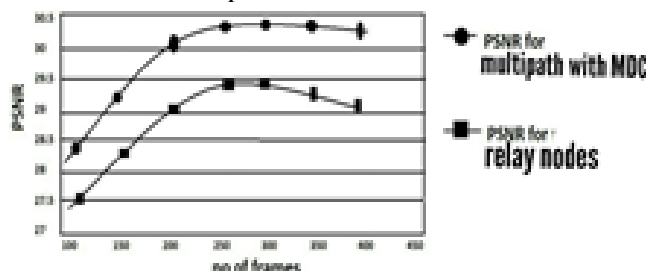


Figure.8. PSNR

Peak signal- to-noise ratio frequently compressed as PSNR, is a technical term for the ratio between the utmost feasible power of a signal and the power of perverted noise that affects the constancy of its representation. PSNR alone does not mean much but there should be use of a quality metric, that can calculates the variations between the standards of the encoded video and the corrupted video.

Peak signal to noise ratio is defined through the following graphical representation. In the case of existing system the PSNR values are relatively low thus the quality of image is low. When compared to the proposed system the image quality is high.

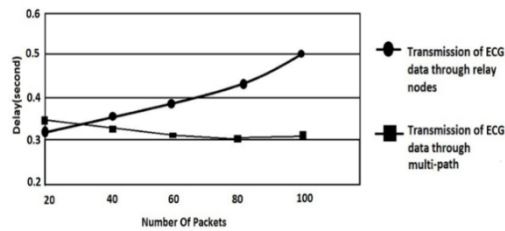


Figure.9. Transmission of ECG data

With the use of relay nodes the data transferred is shown in the graph drawn between the number of packets and the delay. The delay rate is less in the proposed system when compared to the existing system.

3. CONCLUSION

In this paper we propose a system for the patients with cardiovascular diseases. Who live alone (or) away from the hospitals, it is necessary to monitor their health condition continuously. The patient consists of a mobile care device which sense the patient abnormal conditions and transmits the ECG data to the health care services through multiple paths where multiple paths are selected by using SMMDSR protocol and paths are selected based upon least congestion and delay. In addition to this we proposed the physiological monitoring stem that is based upon video recording instantly and sending through multiple-description video streaming (Zhou, 2008) in wireless multi-hop networks which can continuously monitor the patients abnormal condition at any time or any place without any distortion due to the extended communication (Rudlovic, 2007) coverage by installation of camera and multiple description video streaming in wireless multi-hop networks, where the video is sent in multiple paths based upon their actual delay and also the foremost I-frames are sent in main path and remaining P, B frames are sent in the deputy paths. Here the video is encoded by using MDC video coding (Akyol, 2007) where the video stream is split into multiple streams also referred as descriptions and the reconstruction of the video quality is comparable with the number of received descriptions, by that it reduces transmission losses. And reliable delivery of data can be achieved. So that health care services can continuously monitor chronic patient without any distortion and can prevent the sudden death rate of chronic patients.

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