MEDICAL ULTRASOUND VIDEO COMMUNICATION OVER MOBILE LTE NETWORKS WITH HIGH RESOLUTION ERROR AND LOW RESILIENCE LATENCY

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Abstract—In this study, we describe an effective video communication framework for the wireless transmission of HEVC medical ultrasound video over mobile LTE networks. Medical ultrasound video is encoded using diagnostically driven, error-resilient encoding, where quantization levels are varied as a function of the diagnostic significance of each image region. We demonstrate how our proposed system allows for the transmission of high-resolution clinical video that is encoded at the clinical acquisition resolution and can then be decoded with low delay. To validate performance, we perform MATLAB simulations of mobile LTE medium access control and physical layers characteristics that include service prioritization classes, different modulation and coding schemes, fading channel’s conditions, and mobility. We encode the medical ultrasound videos at the 4CIF (704×576) resolution that can accommodate clinical acquisition that is typically performed at lower resolutions. Video quality assessment is based on both clinical (subjective) and objective evaluations.

Keywords—Diagnostic region of interest (ROI), e-health, error resilience, flexible macroblock ordering (FMO), 4G, HEVC, HSPA, m-health, mobile LTE, telemedicine, ultrasound video, video quality assessment (VQA).

1. INTRODUCTION

The wireless communication is the transmission of information over a distance without requiring wires, cables or any other electrical conductors. Wireless communication is one of the important mediums of transmission of data or information to other devices. The Communication is set and the information is transmitted through the air by using electromagnetic waves like radio frequencies, infrared, satellite, etc., in a wireless communication network.

At the end of the 19th century, the first wireless communication systems were introduced and the technology has significantly been developed over the intervening and subsequent years. Today, the term wireless refers to a variety of devices and technologies ranging from smart phones to laptops, tabs, computers, printers, Bluetooth, etc.

2. RELATED WORK

“HIGH EFFICIENCY VIDEO CODING FOR ULTRASOUND VIDEO COMMUNICATION IN M-HEALTH SYSTEMS”

This paper compares the performance of the emerging high efficiency video coding (HEVC) standard to the current state-of-the-art H.264/AVC standard. The experimental evaluation, based on five atherosclerotic plaque ultrasound videos encoded at QCIF, CIF, and 4CIF resolutions demonstrates that 50% reductions in bit rate requirements is possible for equivalent clinical quality.

“WIRELESS ULTRASOUND VIDEO TRANSMISSION FOR STROKE RISK ASSESSMENT: QUALITY METRICS AND SYSTEM DESIGN”

In this paper preliminary findings on three carotid ultrasound videos at CIF resolution, for packet loss rates up to 30%. Subjective quality evaluation incorporates a clinical rating system that provides for independent evaluations of the different parts of the video. Experimental results show that encoded videos attain enhanced diagnostic performance under noisy environments, while at the same time achieving significant bandwidth requirements reductions.

3. PROPOSED SYSTEM

3.1 INTRODUCTION

Now a days, continuous advances in medical video coding, together with wider availability of current and emerging wireless network infrastructure, provide the key technologies that are needed to support m-health video communication technologies in standard clinical practice. Over the past decade, demand for mobile health systems has been growing. In our proposed system will proposes, During the mobility problems many patients are died so using this video communication HEVC over LTE and LTE networks and this will used for preparing surgery chamber and give some instruction to certain critical conditions.

Fig 3.1 Block diagram of video transmission from ambulance to hospital

3.2 METHODOLOGY

We investigate high-resolution medical video Communication performance over mobile LTE and LTE networks based on realistic clinical scenarios. The aim is to model realistic scenarios that can be used to evaluate the challenges associated with developing mhealthvideo systems for emergency telemedicine. Such a system is illustrated in
The key concept is to communicate the patient’s video (trauma or ultrasound) to the hospital premises, for remote diagnosis and assistance with in-ambulance care, moreover for better triage and hospital admission related tasks (e.g., surgery chamber preparation).

3.3 OFDM

The Orthogonal Frequency Division Multiplexing (OFDM) is a multi-carrier digital modulation technology. The research on the technology is traceable to the middle of 1960s. The concept of OFDM has remained for years. However, it was recognized as a good approach for high-speed bi-directional wireless data communication until the development of media industry recently. The technology is adopted by the European Digital Television Standard (DVB-T) and Digital Audio Broadcasting (DAB) standard, and it is the core technology of WLAN (ETSI HiperLAN/2 and IEEE802.11a) and broadband wireless access (IEEE 802.16). Along with the development of DSP CMOS chips, some mature technologies adopted by Fourier Transform/Inverse Transform and high-speed Modem, such as 64/128/256QAM, Trellis Coding, soft decision, channel 24 adaptive, inserting guard time, reducing equilibrium calculation, are gradually introduced into the field of mobile communication.

4. SIMULATION RESULTS

4.1 DIAGNOSTICALLY RELEVANT ENCODING

To demonstrate the efficiency of the proposed diagnostically relevant encoding scheme, we provide a comparative evaluation of: 1) FMO with constant QP video slices and 2) FMO with variable QPs and RS for communications in noisy environments. Fig. uses box plots to illustrate the bit rate requirements of the medical ultrasound video dataset, for the two investigated encoding schemes. Bit rate gains for equivalent perceptual quality are computed using the BD-PSNR algorithm, based on the four rate points shown in Fig. The average bit rate demands reductions are 42.3% for 4CIF, 39.8% for CIF, and 34.7% for QCIF resolution videos. Bit rate gains are functions of the area occupied by the diagnostic ROIs, and most of the savings come from compressing the background.
5. CONCLUSION AND FUTURE WORK

This paper proposes an H.264/AVC-based framework for the wireless transmission of atherosclerotic plaque ultrasound video over mobile LTE and LTE networks. The depicted diagnostically driven encoding scheme shows that equivalent clinical quality can be obtained at significantly reduced bitrate demands. When combined with recent postprocessing error concealment techniques, it can provide for additional diagnostic resilience. On the other hand, 16-QAM 3/4 and 64-QAM 3/4 provide higher network capacities and are preferable when the transmitting station is closer to the BS. The performance of the system in terms of transmitted video’s quality was evaluated using both objective and subjective evaluations. In the future, we also want to investigate how diagnostic encoding based on the emerging high efficiency video coding (HEVC) standard can lead to more efficient, error-resilient encoding. Moreover, the proposed framework is currently validated for use in other medical video modalities.

REFERENCES