Abstract
Multimedia applications over wireless sensor networks (WSNs) are emerging rapidly. There is an increasing interest in the research community to design and develop critical services which require video monitoring or emergency voice calls over WSNs. On the other hand, storage, processing and bandwidth limitations of sensor nodes make multimedia data transmission a challenging issue for WSNs.

In this engineering project, a two hop network testbed is used to analyze the possibility of sending short voice commands over resource constrained WSNs. The testbed consists of one Tmote Sky node as a sensor mote with embedded microphone for voice recording and three tiny Tmote Sky sensor motes for wireless transmission of segmented voice data packets. The data packets are transmitted over lossy wireless channels to a sink node where the success of transmission is measured in terms of Mean Opinion Score (MOS) and Signal-to-Noise Ratio (SNR). The testbed results indicate that sensor nodes are capable of meeting quality requirements of voice applications.

What is Voice Over WSN (VoWSN)?
The transmission of audio signals throughout a wireless network in which every node is capable of sensing and interpreting events and processing jobs collaboratively with other nodes is called VoWSN. With VoWSN, voice data captured with an event trigger can be transferred in an automated way. The advantage of VoWSN to similar technologies is flexibility and scalability of the network.

Recording Voice and Data Transfer
Transmission of voice in WSNs requires an efficient buffering management suitable for adaptive networks. Due to resource constrained structure of Tmote Sky, MSP430FG4618 is utilized to capture voice and recorded signals are serially imported to the sink node of WSN. The bulk data transfer is done by Tmote Sky nodes throughout the network. The transmitted data is received on the end point of WSN and serially gathered to a computer in an attempt to play the voice and make inferences about testbed environment.

Future Work
As future work, voice sensor circuits as microphone will be embedded to the Tmote Sky board, so more assistive technology applications can be done with voice data for disabled and elderly people.

Voice Quality Evaluation
Voice quality in a lossy network needs both objective and subjective measurements. In order to measure the network quality, Signal-to-Noise Ratio (SNR) objective metric is applied on the transmitted and received signals. The measurement of voice quality is carried out by a perceptual metric, called Mean Opinion Score (MOS), in which values from 1 to 5 are generated by averaging the results of subjective tests applied on a set of 8 people, where perceived quality of received voice data is indicated as MOS values.

Motivation
Intended population of VoWSN in this project is disabled or helpless elderly people living indoor and the main target is to make them benefit from the freedom of transferring information over a scalable and fully automated wireless medium. In an emergency situation, the voice signals recorded in an environment will be transmitted to the network end-point in order to assist people needing urgent help.

References