COMPENSATION OF CHANNEL UNRELIABILITY USING EVENT BASED SAMPLING

By

CDR(L) LE JAYASURIYA

(KDU/MSC/EN&T/01/05)

The Dissertation submitted to

GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY, SRI LANKA

In partial fulfilment of the requirement for the award of the degree

Of

Master of Science in Electronics and Telecommunication Engineering

01st January 2021

ABSTRACT

In recent years, sensor technology has witnessed extraordinary growth and everything is getting sensed electronically.Vehicles, roads, buildings, air spaces, the environment, and many industrial applications are using various types of sensors. Most sensors are connected and controlled wirelessly using GSM and direct channels for various applications. Such applications are demanding reliable data transmission for detection, estimation, and prediction. Developing a method that communicates as few times as possible without losing the performance in an unreliable communicant channel is a challenge. Data transmission should be reliable, accurate, and precise for the finest results in any application. Environmental factors such as terrain , vegetation and weather conditions can have a huge impact on wireless signal integrity. For example, lightning can cause electrical interference, and fog can weaken signals as they pass through. Particularly in rural areas, cellular coverage may not be adequate to maintain a reliable channel for data transmission due to various reasons. This channel unreliability causes drawbacks such as packet dropouts, packet delays, and quantization errors. Event based sampling techniques such as Memory Based Event Trigger (MBET) and Dead band Error Modulation (DEM) could be utilized to support reliable data transmission in an unreliable wireless channel.

This paper will discuss the ability to compensate channel unreliability in a wireless network using event based sampling techniques namely MBET and DEM. During the research MATLAB, Simulink simulations were used and benchmark setups were proposed for Periodic Sampling, MBET and DEM to check the performance in unreliable channels under channel failure probability conditions since there were no such benchmark setups in the available literature. The performance was ascertained under various channel failure probability conditions from 0.05 to 0.95 in 0.05 steps and reconstructed signal RMS error is calculated for sinusoidal signal input with sampled time 1ms and for actual temperature data input.

According to the result obtained observed RMS error of reconstructed signal was increased with the increasing channel failure probability for above indicated sampling techniques namely Periodic Sampling, MBET and DEM. However, MBET has shown improvement of reconstructed signal RMS error value compared to the Periodic Sampling under increasing channel failure probability conditions. Finally, it can become to a conclusion that MBET can compensate the channel unreliability in an unreliable wireless communication network.