

Abstract

Omar M. Elsamadisy

A Novel Communication System based on Mutual Ecological Model

Long Term Evolution (LTE) technology is challenged by high data rate demanding services and increasing number of mobile phones. To respond to this challenge, 3rd Generation Partnership Project (3GPP) initiated a Study Item which studies the co-existence of Wi-Fi and LTE technologies in the same unlicensed 5 GHz band. Considering that Wi-Fi and LTE are originally designed to operate in totally different bands, unlicensed and licensed, it is hard to achieve this coexistence for these two incompatible access technologies. Consequently, 3GPP introduces the Listen Before Talk (LBT) mechanism to warrant the coexistence viability of both two access technologies in that band. This study item consists of License Assisted Access (LAA)-based LBT including Load Based Equipment (LBE) mechanism which is designed to compete with Wi-Fi-based access mechanism towards a fair access on the shared channel. Lately, when a survey is done to look for truly sustainable and robust systems, the only real model that has worked over very long periods of time is the natural world. This work is targeting to take benefits from the natural ecological systems to find solutions for wireless communication systems challenges by following nature's strategies and imitating them. The main idea is that nature has already solved many of the problems we are dealing with. The aim of this research is to find a way that looks for rational solutions for communication systems' challenges by matching nature's time-tested patterns and strategies. This would be achieved through evaluating the performance of the newly proposed 3GPP medium access control (MAC) and Wi-Fi-based mechanisms under diverse scenarios with various parameter configurations. The evaluation is carried out through simulations and the considered performance parameter is the channel efficiency obtained after multi-competitions on the shared channel. Additionally, two MAC mechanisms are proposed which are referred to as enhanced LBE (E-LBE) and Enhanced CSMA/CA (E-CSMA/CA) and then their performance is evaluated and compared to the basic LBE and Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) MAC mechanisms.