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Spectrum Allocation Scheme for IoMT Devices Using Game Theory

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ABSTRACT

There are a lot of challenges like versatility, network, receptiveness, accuracy, etc. when working on an internet-connected device because of the wide usage of them across the globe. Currently there is a huge demand for reliable ways to connect to wireless. The same was conveyed as part of multiple observations, and many have explained how spectrum sensing helps to allocate dynamically the unlicensed frequency bands for IoT applications reducing traffic and enabling the IoT technologies. The goal of cognitive radio is to use the unadopted spectral spaces called spectral holes. A non-cooperative game theoretic strategy is employed to study the same and the formulation of a utility function in terms of spectral usage rate of the users in a CR network. For obtaining the spectral usage rate, a 2-D continuous-time Markov chain (CTMC) scenario is proposed to obtain the strategy for the users of CR in order to choose the appropriate spectral gaps. The parameters such as percentage utilization of spectrum by varying parameters like traffic, number of users, and data burst rates are studied.

KEYWORDS

Continuous-Time Markov Chain, Game Theory, Internet of Things, Spectrum Utility Percentage

INTRODUCTION

Amid the past few a long time, the vision of the term Web has been always growing its wings in each angle of life. It has ended up being a challenging task for analysts to clearly recognize the ideal potential of Web utilization. As the time goes, the term of Internet has been related with things and is presently being recognized as IoT (Ashton, 2009) . As the name portrays, things are connected to Web thorough Wireless Sensor Networks (WSN), Radio frequency Identification (RFID), Wireless Sensor Networks(WSN), Bluetooth, Near-field communication (NFC), Long Term Evolution (LTE) and different other sharp communication technologies. Thus, IoT can be characterized as “things that are associated over the Internet.” This association makes a difference in of in-formation assembled from different devices to predetermined places over the Web. Since IoT is the foremost dependable term of the technological world in today’s date, it still needs through the potential compliance that it is competent of. In such a complicated situations, this document set to help all those who need a straightforward and an approach to derive the concept. We are hoping to add more information about this in future in best way possible.

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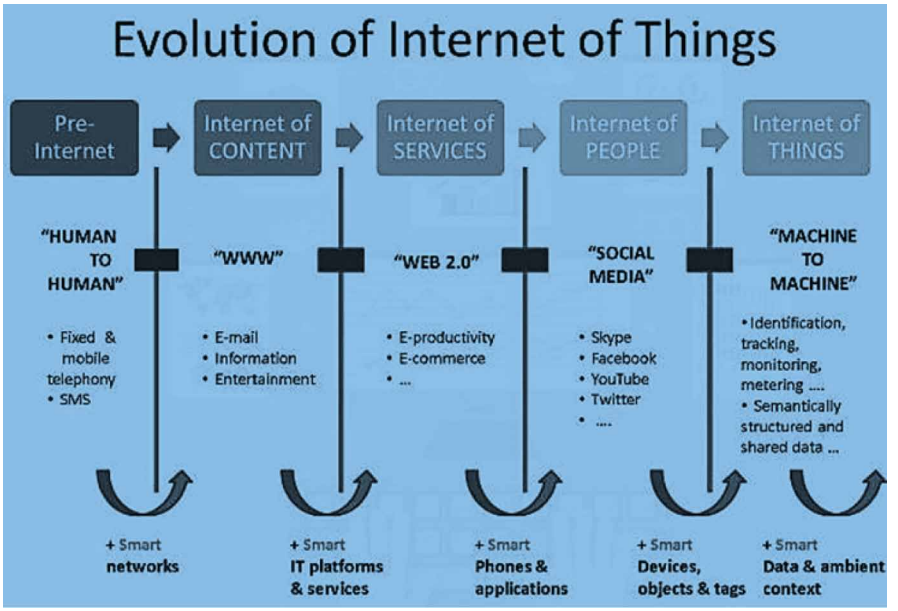
Figure 1. Evolution of Internet of Things



The Internet of Things (IoT) concept has been handled in numerous ways (Amin et al., 2019; Barua et al., 2020; Zhu et al., 2018) and has emerged due to the gigantic advances within the electronics at Cyber Physical Systems (CPS) level. As per the Statistics projected by Cisco by 2030 the number of machines that will be associated to the Web will be nearly 100 billion, whereas this number is persistent to develop incrementally, it is expected that the number of IoT connected machines will be nearly twice the entire human population. This means there is high chance of having difficulties with respect to versatility, flexibility, connection, availability and credibility of the machines utilized within the remote systems.

A huge rate of radio joins for IoT machines utilize ISM bands (Industrial, Scientific and Medical) which provide an unlicensed communication in most nations. One of the most prominent difficulties to reach adaptability of the associated objects in a remote arrange is to characterize the frequency bands to create future solutions without signal interference reaching convergence of distinctive innovation and applications.

Cognitive radio (CR) is one of the unused advancements that are being put in radio receiver technology. As the need to use the radio spectrum efficiently has increased, the thought for Cognitive radio is introduced. With this we can maintain the reliable communication for any spectral conditions. With the available technology, we are capable to develop a radio that will look at the spectrum and identify the frequencies which were having more clarity over the other and then develop a communication based on the goals of our works. In this way Cognitive Radio is capable to identify the frequency band, the sort of modulation, and power levels most suited to the requirements and winning conditions.

This paper tries to implement the concept of CR to IoT so as to make the devices able to select the efficient spectrum for better communication.

BACKGROUND

In a cognitive radio network, the spectrum can be traded between spectrum owners and spectrum leasers to maximize the utility of primary users while maximizing the use of secondary users. Spectrum management presents two models: one without game theory and other one with game theory: