Techniques for Optimising Bluetooth Stereo Audio

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Abstract

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Introduction

Bluetooth is a Wireless Personal Area Network (WPAN), developed in 1994 by the Bluetooth Special Interest Group (SIG) with the intention of replacing cables connecting personal computers and peripheral devices [Bluetooth SIG 2001]. It operates in the unlicensed 2.4 GHz ISM (Industrial-Scientific-Medical) band, which is split into 79 1 MHz wide channels [IEEE 802.15.2 2003], and has an operational distance of 10-100m.

A physical radio channel is shared by a group of Bluetooth devices, known as a piconet. Each Piconet compromises of a single master and up to seven slave devices [Bluetooth SIG 2001]. A larger network called a Scatternet can be formed when two or more Piconets connect through a bridge or relay device [Pinkumphi and Phonphoem 2009]. The systems are synchronised to a common clock and specific frequency hopping pattern, which is used to combat interference. In the pattern, the 79 frequencies of the ISM band are placed in an algorithmically determined pseudo-random order, based on the device address and master clock [IEEE 802.15.1 2005]. The system hops between these frequencies using a Time Division Duplex (TDD) method dividing each second into 1600 time slots (625µs per slot) [Pinkumphi and Phonphoem 2009]. The pattern is adaptive, whereby frequencies used by interfering devices may be excluded [IEEE 802.15.1 2005].

The IEEE Std 802.11 states that the Wireless Local Area Network (WLAN) operational frequency should also be 2.4 GHz [IEEE 802.11 2005]. As both the WLAN and Bluetooth standards operate in the same frequency band, there may be interference between the two systems [IEEE 802.15.2 2003]. There may also be interference from other wireless systems, such as cordless telephones and microwaves, which could result in severe performance degradation [Gehrmann et al. 2004].

The most important factors for a stable wireless system are power and throughput efficiency [El-Bendary et al. 2009]. Bluetooth stereo audio uses Advanced Audio Distribution Profile (A2DP). It utilises a packetised structure with frame based audio codecs for audio compression [McClintock 2016].

aptX HD, the use of the Qualcomm Interoperability program, the silicon platforms improving and the benefits of Bluetooth Smart.

# Section

## Subsection

### Sub-subsection

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