

Audio Beacon

Providing Location-Aware Content for Low-End Mobile Devices

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ABSTRACT

Location Based Services can generate variety of new commercial applications and generate new streams of revenue. However, there is currently no simple indoor positioning method for low-end devices which have no Wi-Fi or GPS capability. This type of method should be designed without including extra hardware at the mobile device, and using low cost infrastructure to provide the context position. This paper presents a novel solution for providing location-aware content using barely audible signals. In the proposed system, Audio Beacons (loudspeakers) scattered through a given environment send multiple tones with identification codes. These tones are sent over frequencies close to 20 kHz, yielding a tone that is not easily perceived by most people with normal hearing conditions. The strength of these tones is determined by the mobile devices and compared to information previously stored, from which an identification code is obtained for that environment. The proposed solution was validated with real experiments, showing that acoustical waves can be used effectively to transmit information to mobile devices with no special hardware. The proposed approach was tested in a controlled scenario with similar noise floor as the one observed in a chaotic scenario, e.g. subway station, yielding 100% hit rate for frequencies below 19 kHz. Additionally, tones at frequencies close to 20 kHz are poorly detected due to the frequency response of the device's microphone. Finally, the observed average noise power at frequencies close to 20 kHz is small even in chaotic scenarios, which indicate that the method is robust against the noise present in most environments.

KEYWORDS: Context location, Audio beacon, low cost devices, non-audible range.