Demo: Indoor Localization without Infrastructure using the Acoustic Background Spectrum

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ABSTRACT

We demonstrate an indoor localization technique to be presented as a full paper at this MobiSys conference [2]. In that paper, we introduce a new technique for determining mobile phone's indoor location even when Wi-Fi infrastructure is unavailable or sparse. Our technique is based on a new ambient sound fingerprint called the Acoustic Background Spectrum (ABS). This demonstration has two components. First, it shows attendees a live view of the ABS in the demonstration hall. This allows attendees to test the claim that the ABS is stable and robust to transient noise. Attendees can speak or make noise and observe the consequent effect on ABS. In the second demonstration, short sound recordings from various rooms are played on a set of headphones. Simultaneously, a photograph of the room and a plot of the ABS is shown. This demonstrates the ambient sound variations present in a set of sample rooms and allows attendees to test their own ability to distinguish locations based on sound.

Categories and Subject Descriptors

H.3.4 [**Information storage and retrieval**]: Systems and software.

General Terms

Algorithms, experimentation, measurement, performance

1. BACKGROUND INFORMATION

The intuition behind ABS-based localization is that modern life is full of noises: computers whirr, lights buzz, and air conditioning blows. The field of architectural acoustics tells us that a room's geometry and furnishings strongly affect what is heard. That is, the persistent acoustic drivers of a room, and the room's impulse response combine to form a distinct "sound" of the room. While it is obvious that a lecture hall sounds might sound different than an office, we show that two otherwise similar-looking rooms are also very likely to have different persistent acoustic characteristics.

Our indoor localization technique is based on a new ambient sound fingerprint called the Acoustic Background Spectrum (ABS). An ABS serves well as a room fingerprint because it is compact, easily computed, robust to transient sounds, and surprisingly distinctive. As with other fingerprint-based localization techniques, location is determined by measuring the current fingerprint and then choosing the "closest" fingerprint from a database. An implementation of ABS-localization called Batphone is publicly available [1] for Apple iPhones and is shown in Figure 1.

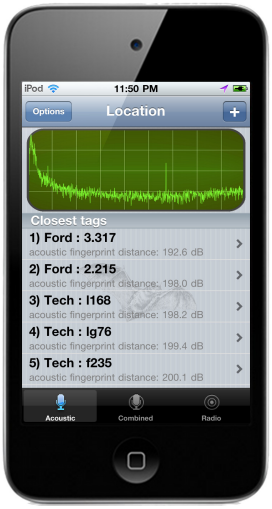

Figure 1: Apple iPod Touch running our Batphone localization software.

2. REFERENCES

[1] Batphone software project web page. `http://stevetarzia.com/batphone`.

[2] Tarzia, S. P., Dinda, P. A., Dick, R. P., and Memik, G. Indoor localization without infrastructure using the acoustic background spectrum. In *Proc. Intl. Conf. on Mobile Systems, Applications, and Services (MobiSys)* (June 2011). to appear.

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