

**Privacy-Preserving Crowdsourced Spectrum Sensing**

**Abstract:**

Dynamic spectrum access is promising for mitigating worldwide wireless spectrum shortage. Crowdsourced spectrum sensing (CSS) refers to recruiting ubiquitous mobile users to perform real-time spectrum sensing at specified locations and has great potential in mitigating the drawbacks of current spectrum database operations. Without strong incentives and location privacy protection in place, however, mobile users will be reluctant to act as mobile crowdsourcing workers for spectrumsensing tasks. In this paper, we first formulate participant selection in CSS systems as a reverse auction problem, in which each participant’s true cost for spectrum sensing is closely tied to his current location. Then, we demonstrate how the location privacy of CSS participants can be easily breached under the framework. Finally, we present PriCSS, a novel framework for a CSS service provider to select CSS participants in a differentially privacy-preserving manner. In this framework, we propose PriCSS*−* and PriCSS+, two different schemes under distinct design objectives and assumptions. PriCSS*−* is an approximately truthful scheme that achieves differential location privacy and an approximate minimum payment, while PriCSS+ is a truthful scheme that achieves differential location privacy and an approximate minimum social cost. The detailed theoretical analysis and simulation studies are performed to demonstrate the efficacy of both schemes.

**Existing System:**

Avoiding harmful interference with primary users is the first principal in DSA systems. FCC advocates a solution based on spectrum databases, each currently administrated by private entities such as Google and Microsoft. Each spectrum database administrator accepts registrations from primary users and leverages a well-known propagation model to predict the coverage boundary of each primary user. Each secondary user needs to inquire the spectrum database about the channel occupancy at a chosen location before transmitting there. Current spectrum databases have well-known drawbacks. First, the signal propagation

models in use are not accurate, leading to either severe under-utilization of the spectrum or interference with primary users. Second, current spectrum databases cannot provide the quality information of channels, which can significantly vary in space and time. Last, the locations of primary and secondary users cannot be validated, so a spectrum database administrator may return wrong spectrum occupancy information to secondary users.

**Proposed System:**

A typical CSS system works as follows. The spectrum database administrator publishes spectrum-sensing tasks either periodically or randomly. Each spectrum-sensing task involves one or multiple channels, a pre-determined set of geographic locations, and the specified sensing time. The sensing results from designated locations can be aggregated to jointly determine the channel occupancy at the specified time. Each mobile user in the CSS system can independently decide his capability of performing the sensing tasks. Given possibly many CSS participants, the spectrum database administrator can select some for each sensing task. There are many challenges for pushing the promising CSS system above into practice.