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**Traffic-Aware Optimal Spectral Access in Wireless powered Cognitive Radio Networks**

**Abstract:**

Traffic patterns associated with different primary users (PUs) might provide different spectral access and energy harvesting opportunities to secondary users (SUs) in wireless powered cognitive radio networks (WP-CRNs). Since the traffic applications have their own distinctive patterns, spectral access and energy harvesting opportunities are also expected to be distinctive. In this paper, we propose a novel approach to identify the PU traffic patterns and estimate the energy harvested from each traffic pattern so that SU can maximize its capacity accordingly. More specifically, we propose a theoretical framework based on a variational inference algorithm to cluster various traffic patterns and design a threshold-based SU transmission strategy by taking into account the spectral access and energy harvesting opportunities for each traffic pattern, so as to optimize SU transmission. Through simulations, we demonstrate the effectiveness of the proposed scheme in terms of throughput gains and show the transmission thresholds under various traffic applications (patterns). Further, we illustrate the effects of different collision costs on throughput for different traffic applications using real wireless traces.

**Existing System:**

CRNs rely on predefined PU channel idle and busy time distributions, which are assumed to be priori known. However, in practice, these distributions depend on the currently active traffic pattern (application), and as the traffic application changes, the PU idle/busy time distributions also change. It is, therefore, crucial for SUs to be aware of the PU idle and busy time distributions corresponding to each PU traffic application. Most Internet applications exhibit different behaviors with respect to features that have distinguished characteristics. The challenge here is twofold: to precisely identify the PU traffic patterns so that the application-specific spectral access and energy harvesting opportunities can be estimated, and SUs optimize their transmission subject to the energy causality while avoiding collision with PUs.

**Proposed System:**

We propose a threshold-based framework for optimal spectral access strategy and show that the threshold is optimal and traffic-dependent. The proposed threshold-based strategy takes into account both the spectral access and energy harvesting opportunities provided by a particular traffic application. The harvested energy depends on several factors, such as the distance of SU from PU, antenna type (omnidirectional, directional, beamforming), transmit power, frequency, terrain, etc. Especially, the proposed framework is general and applicable to various energy models.