

**CHENNAI – PONDICHERRY**

**TSCA: A Temporal-Spatial Real-Time Charging Scheduling Algorithm for On-Demand Architecture in Wireless Rechargeable Sensor Networks**

**Abstract:**

The collaborative charging issue in Wireless Rechargeable Sensor Networks (WRSNs) is a popular research problem. With the help of wireless power transfer technology, electrical energy can be transferred from wireless charging vehicles (WCVs) to sensors, providing a new paradigm to prolong network lifetime. Existing techniques on collaborative charging usually take the periodical and deterministic approach, but neglect influences of non-deterministic factors such as topological changes and node failures, making them unsuitable for large-scale WRSNs. In this paper, we develop a temporal-spatial charging scheduling algorithm, namely TSCA, for the on-demand charging architecture. We aim to minimize the number of dead nodes while maximizing energy efficiency to prolong network lifetime. First, after gathering charging requests, a WCV will compute a feasible movement solution. A basic path planning algorithm is then introduced to adjust the charging order for better efficiency. Furthermore, optimizations are made in a global level. Then, a node deletion algorithm is developed to remove low efficient charging nodes. Lastly, a node insertion algorithm is executed to avoid the death of abandoned nodes. Extensive simulations show that, compared with state-of-the-art charging scheduling algorithms, our scheme can achieve promising performance in charging throughput, charging efficiency, and other performance metrics.

**Existing System:**

Sensors carry rechargeable batteries and one or more Wireless Charging Vehicles (WCVs) are responsible for replenishing energies for them. It is obviously critical for WCVs to charge sensors before their battery energy runs out, rendering them dead. Hence, WCV charging schedule becomes a prominent issue in WRSNs. Di\_erent perspectives have been investigated in WRSNs, including path planning, system performance optimizing collaborative charging and so on. In technical literature, scheduling methods are two-folds: deterministic In deterministic methods, charging for individual nodes is carried out in a periodic and deterministic manner. Such methods usually require explicit system information, such as exact node locations, energy consumption rates, etc. Some of these can fluctuate dramatically in WRSNs. Therefore, deterministic methods are infeasible, especially for a large scale WRSN. methods and non-deterministic methods

**Proposed System:**

To promote overall performance of WRSNs, the charging scheduling problem is formalized as a multi-objective optimization problem, which focuses on minimizing the number of dead nodes and maximizing energy e\_ciency simultaneously. Then a temporal-spatial charging algorithm TSCA is developed for finding optimal charging paths, aiming at achieving our objectives.

To obtain conditional global optimal charging solutions in the NP-hard charging scheduling problem, we theoretically prove the optimality of TSCA. It also owns a low complexity, which will not go beyond control. Then simulation results confirm that TSCA is able to find the conditional optimal charging solution in the on-demand architecture, validating our theoretical analysis.

To the best of our knowledge, we are the first to analyze the impact of low e\_cient nodes, which may cause dramatic increase in traveling and degrade the charging performance. An algorithm for alleviating such nodes is derived and simulations are conducted to show its ect.

To illustrate the advantages of the proposed scheme, extensive experiments are conducted to compare our method with the state-of-the-art NJNP and DWDP charging schemes in diverse aspects. Validations of our model are also provided, ensuring the rigor and persuasiveness of our schemes.