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Summary of: "A Prediction System Using a P2P Overlay Network for a Bus Arrival System"

With an increase in population, it isn't feasible for everyone to drive their own vehicles, and heavier use of bus transportation is part of a solution to this issue. However, bus transportation isn't fully reliable, decreasing the willingness of people to use it. This paper presents a solution to the issue of reliability, through using a Peer-to-Peer (P2P) overlay network to communicate among bus stations, and Wireless Sensor Networks (WSN) to communicate between buses and bus stations. The authors hope that this system will decrease pollution, increase revenue for the city and decrease costs and improve bus arrival prediction accuracy in comparison to the existing centralized prediction system. Electronic toll collection, traffic monitoring, gathering of traffic statistics and traffic safety improvements are further goals of the authors mentioned throughout the paper.

The current system uses a centralized topology. Each of the bus stations communicates directly with the central computer. The central computer performs all of the necessary calculations and returns that data back to the individual bus stations. In contrast, in the suggested P2P Arrangement Graph Overlay Network (AGO), bus stations communicate directly with their neighbors, and indirectly to non-neighbors through their neighbors. Each bus station performs its own calculations with data provided by other bus stations and from data gathered from the buses within their WSN range. Two major issues involved with the centralized system include: 1) bandwidth availability for sending data to and receiving data from the central computer, and 2) processing capabilities of the central computer.

In regard to the WSNs, the authors do not make it clear how current data is transferred from bus to bus station. Is it an older less efficient type of WSN? Or is there any communication made at all? They do make clear that any wide-scale implementation of WSNs will require cheap, small and dynamic sensors. I disagree that power consumption will be an issue, as the sensors will be located on buses which can supply any energy necessary.

The authors describe a typical day in the use of the proposed system. In the morning, bus stations join the P2P overlay network by linking to neighboring bus stations. When a bus is in the coverage of a bus station, the station gathers data, such as bus speed and location, from the bus. The station analyzes the data and sends its analysis to its neighbors. The neighbors use this information to display expected arrival times on information boards. Bus stations also make note of actual arrival times. At night, when buses aren't running, the stations send the data to a central computer which analyzes the data to improve overall system accuracy and efficiency. As system adjustments are only made at night, this could leave the system vulnerable to major intra-day issues (e.g. major emergency situations).

While there has been no real-world implementation of the proposed system, the authors did develop a simulation. Simulation variables include bus speeds, number of passengers, traffic light duration, passenger boarding and departure duration and time of day. At peak times, the simulation yielded an accuracy of 76%, and an accuracy of 85% to 90% for non-peak times. A major issue with this paper is that the authors did not include any data or analysis which compares their simulation results with existing system accuracy. They do provide a comparison of the number of messages sent to the

central computer under each system, and clearly the proposed system has an advantage in this regard, but is the advantage enough to override any disadvantages with the proposed P2P system?

This was a clear and well written paper, but it seems more fitting for publication to a journal of computer science on networking rather than a journal of applied mathematics. I saw very little math applied to any concept (except for the AGO) throughout the paper. Maybe the referenced papers address the underlying mathematical concepts, and this paper aggregates the results of those papers into a major concept? The "Conflict of Interests" section is strange. Is this a requirement of the publisher?