This dissertation presents contributions to the fields of mobility modeling, wireless sensor networks (WSNs) with mobile sinks, and opportunistic communication in theme parks. The two main directions of our contributions are human mobility models and strategies for the mobile sink positioning and communication in wireless networks.

The first direction of the dissertation is related to human mobility modeling. Modeling the movement of human subjects is important to improve the performance of wireless networks with human participants and the validation of such networks through simulations. The movements in areas such as theme parks follow specific patterns that are not taken into consideration by the general purpose mobility models. We develop two types of mobility models of theme park visitors. The first model represents the typical movement of visitors as they are visiting various attractions and landmarks of the park. The second model represents the movement of visitors as they aim to evacuate the park after a natural or man-made disaster.

The second direction focuses on the movement patterns of mobile sinks and their communication in responding to various events and incidents within the theme park. When an event occurs, the system needs to determine which mobile sink will respond to the event and its trajectory. The overall objective is to optimize the event coverage by minimizing the time needed for the chosen mobile sink to reach the incident area. We extend this work by considering the positioning problem of mobile sinks and preservation of the connected topology. We propose a new variant of p-center problem for optimal placement and communication of the mobile sinks. We provide a solution to this problem through collaborative event coverage of the WSNs with mobile sinks. Finally, we develop a network model with opportunistic communication for tracking the evacuation of theme park visitors during disasters. This model involves people with smartphones that store and carry messages. The mobile sinks are responsible for communicating with the smartphones and reaching out to the regions of the emergent events.

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The public is welcome to attend.