Chapter 4
A Novel Power-Monitoring Strategy for Localization in Wireless Sensor Networks Using Antithetic Sampling Method

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ABSTRACT

The prime objective of this chapter is to develop a power-mapping localization algorithm based on Monte Carlo method using a discrete antithetic approach called Antithetic Markov Chain Monte Carlo (AMCMC). The chapter is focused on solving two major problems in WSN, thereby increasing the accuracy of the localization algorithm and discrete power control. Consecutively, the work is focused to reduce the computational time, while finding the location of the sensor. The model achieves the power controlling strategy using discrete power levels (CC2420 radio chip) which allocate the power, based on the event of each sensor node. By utilizing this discrete power mapping method, all the high-level parameters are considered for WSN. To improve the overall accuracy, the antithetic sampling is used to reduce the number of unwanted sampling, while identifying the sensor location in each transition state. At the final point, the accuracy is increased to 94% wherein nearly 24% of accuracy is increased compared to other MCL-based localization schemes.

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INTRODUCTION

Wireless Sensor Network (WSN) is named as a group of wireless networked low-power sensor devices in which, each node incorporates with microprocessor, radio and a limited amount of storage. The couple of tasks like localizing and tracking, moving stimuli or objects are essential capabilities of a sensor network. The major problems, that are considered in designing the proposed localization algorithm, are high power consumption, cost and time synchronization. Also, localization error, beacon density, 2D analysis structure and low sampling efficiency hinder the performance of the localization algorithms. The existing Adaptive Monte Carlo Technique experiences the foresaid problems. Based on the problem specification the objective of the proposed system is framed to solve the grievances and to obtain the desired optimal results in Wireless Sensor Network. The localization schemes for WSN have been developed in the last 20 years. The schemes have been widely used in various applications like military, civil, multi-robot search teams, automated guided vehicles and many others. These applications consist of multiple autonomous agents locally interacting in pursuit of a global goal. To control over the above system, the distributed control strategy is incorporated. Moreover, the transmission power plays a key role in the design of wireless networks. Power control helps in various functionalities in wireless sensor network which has been stated by Jaein jeong et al. (2007). They are:

- *Interface Management:* In broadcast wireless network, the signals interfere with each other. It is very crucial in CDMA systems where orthogonality between the users is difficult to maintain. In this system, the power control strategy helps the user in efficient spectral reuse and desirable communication experience.
- *Energy management:* The lifetime of the nodes and the network rely on the energy conservation, due to inadequate battery power in mobile stations, hand-held devices and or in any nodes that generally operate on limited energy budget. The energy conservation is made possible through power control strategy.
- *Connectivity management:* In wireless network,the signals are uncertain, energy limited and time-variated. In order to estimate the channel state and to be stay- connected with the transmitter, the receiver should be able to maintain a least possible level of received