

On the Performance Analysis of Coverage and Connectivity under Channel Randomness in WSN

A Dissertation submitted towards the partial fulfillment of
the requirement for the award of degree of

**Master of Technology
in
Microwave and Optical Communication**

Submitted by

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CERTIFICATE

This is to certify that the dissertation title “**On the Performance Analysis of Coverage and Connectivity under Channel Randomness in WSN**” submitted by **Mr. ADITYA SONI, Roll. No. 2K13/MOC/02**, in partial fulfilment for the award of degree of Master of Technology in “**Microwave and Optical Communication (MOC)**”, jointly run by Department of Electronics & Communication Engineering and Department of Applied Physics in Delhi Technological University during the year 2013-2015., is a bonafide record of student’s own work carried out by him under my supervision and guidance in the academic session 2014-15. To the best of my belief and knowledge the matter embodied in dissertation has not been submitted for the award of any other degree or certificate in this or any other university or institute.

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DECLARATION

I hereby declare that all the information in this document has been obtained and presented in accordance with academic rules and ethical conduct. This report is my own work to the best of my belief and knowledge. I have fully cited all material by others which I have used in my work. It is being submitted for the degree of Master of Technology in Microwave & Optical Communication at the Delhi Technological University. To the best of my belief and knowledge it has not been submitted before for any degree or examination in any other university.

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ABSTRACT

The Wireless Sensor Network (WSN) comprises a large number of sensors that are densely deployed in the area of interest to observe a particular phenomenon. There are various applications such as habitat monitoring, military surveillance, weather monitoring etc. where Wireless Sensor Network can be used. In critical environment, where human intervention is not possible, battery of sensor node cannot be replaced in case of power drainage. This adversely affects the requirement of good quality monitoring of the field as well as extended lifetime of Wireless Sensor Network. Therefore, coverage and connectivity which is also a Quality of Service (QoS) is a challenging research area in Wireless sensor Network and extensively focused in this dissertation.

We have investigated the coverage and connectivity issue in randomly deployed Wireless Sensor Network with effect of shadowing. One of the important QoS parameter in the design of WSNs is that network should be fault tolerant to make the system more reliable. So, we have proposed a k -coverage and q -connectivity model that is evaluated under log normal shadowing model to represent the path loss characteristics of natural environment.

Further, we have studied random shadowing effects which are incorporated into path loss and describe received signal strength with distance in real environments. We have also investigated the effect of node density on coverage as well as connectivity. It is observed that probability of network coverage and connectivity depends on the node density standard deviation. By simulation we have also proved that a higher value of standard deviation results in decrease in coverage probability. Also we have observed the effect of communication range on connectivity which shows that when communication range increases connectivity also improves.

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