By-Passing Infected Areas in Wireless Sensor Networks Using BPR

**Introduction :**

Wireless Sensor Networks (WSN) have been playing an important part in different remote event monitoring applications, particularly in hazardous regions and unfriendly situations. In such applications events can be detected through the data sensing and forwarding to the sink node for further processing. Before transmitting the data to sink node, sensors perform the data fusion process to reduce the traffic between fusion nodes and sink node. However, the direct communication between source nodes and sink node can affect by the energy of the node and other resources. Therefore, communication in wireless sensor network can be achieved through the intermediate nodes which in turn forward the got information to another node until packet reach their desired destination. This can save energy and increase the lifetime of their battery.

**Problem definition :**

The software corruption, hardware failure and non-favorable operating environment among different nodes in wireless sensor network can reduce the nodes functionality and affect the entire wireless sensor network operations. Node experiencing such a problem is called an infected node. Due to infected node packets cannot be forwarded to destination these packets become lost or stuck in the infected areas. This problem will increase the packet loss rate and energy consumption. The corrupted data in the packets results in false analyses and wrong decision making at end system. Hence a timely detection of the infected nodes and determine the alternative route to divert the traffic from infected area.

**Objectives :**

* To design the method that can get the stuck packets out of the infected regions.
* To design the method that can by-pass infected areas and reroute the incoming packets to uninfected regions.
* To minimize the effects of infected nodes because effect of trapping important packets inside an infected region could be massive.

**Approach taken :**

* **Identifying the infected nodes :** Fuzzy data clustering method is used for detecting the anomaly in the sensed data. Based on membership values fuzzy data clustering method make the partition of data into clusters and in this method each data element can part of more than one cluster. The membership value represent degree which data element belonging to the particular cluster.

* **By-Passed Routing (BPR) :** The aim of this technique is first to get stuck packets out of the infected regions. Second we divert the incoming packets from infected region. Once the information about the infected region is obtained from fuzzy data clustering than that can be used to by-pass the area and reroute the incoming packets to uninfected region.
* **Getting the Stuck Packets Out :** Some packets are stuck in the region due to the infected nodes and also there is no node available for forward these packets to next hop. If no alternative path arrangement made for these packets than there is high risk of being dropped.

**Existing technology:**

Most of the routing protocols developed for sensor networks employ greedy forwarding (GF) algorithm which forwards a packet to a destination node via 1-hop neighbour. The neighbour that receives the packet will repeat the process until the packet reaches its intended destination.

This technique is proven to be efficient in reducing energy consumption since it does not incur additional routing overhead.However, it suffers from the local minima phenomena or ‘holes’ problem. Local minima generally refers to the the classic situation where packets cannot be forwarded to the next hop since there exists no other node that has shorter distance to destination than itself.

Another issue in the traditional GF is congestion . Since sensors in WSN are densely deployed, some nodes may end up transmitting to the same hop, thus causing traffic overflow. This scenario will severely degrade the whole network performance. One way to tackle this issue is by using multiple paths technique and load balancing . The latter approach deploys geographic position information and a network congestion metric to balance the traffic so that congestion is significantly reduced.

**Software requirements :**

* Operating System : Linux
* Tool used : Network Simulator 2.3
* Programming languages : C++ and OTCL