ABSTRACT

A Wireless Sensor Network consists of spatially distributed autonomous, self-organizing sensors to monitor physical or environmental conditions, such as temperature, humidity, moisture content, sound, pressure, etc. and to cooperatively pass their data through the network to the base station.

Sensor networks when used in the agricultural field free the farmer from the maintenance of wiring in a difficult environment. Factual information obtained from the network provides a good decision support system.

A stringent set of computational and resource constraint make the design and implementation of sensor networks an arduous task. The challenging issue in sensor networks is limited and un rechargeable energy provision. Utmost care has to be taken to save the battery from draining.

The current work is based on the agricultural application which is an ongoing project at Pavagad, Karnataka State, India. Ad hoc On-Demand Distance Vector (AODV) is the protocol used in the existing system. The current work improves upon the existing ones with new protocols B_AODV, S_AODV, T_AODV, M_AODV.

In B_AODV many nodes send data to one sink. It makes use of the existing path if already available during the path discovery.

S_AODV uses the spatial information and avoids broadcast of control packets during path discovery along directions which results in higher hop count.

T_AODV takes the highest total energy along the path so that path once established will be stable for long intervals of time avoiding repeated path discovery.

M_AODV customizes the path such that minimum residual energy along a path is the highest.
Various methods of handling and avoiding packet loss are addressed with regard to the failure of nodes due to energy.

The proposed protocol achieves energy efficiency by reducing the number of data transmissions by using hierarchical structure. The protocol exploits the spatial coherence between the data sensed by the neighbouring sensor nodes in a cluster to reduce the number of packet transmissions.

In-network data aggregation by techniques like averaging assists in avoiding repeated transmission of related data. Localized aggregation followed by overall maximum and minimum moisture content of the whole network at periodic interval is carried out. Events are triggered when the battery level is low or water level is above/below the required threshold value. Substantial gain in energy is achieved by combining packets from different sources and sending it as one super-packet to the destination.

Communication energy is the major contributor to total energy expenditure and one factor which determines it is the transmission distance. The transmission distance and topology are suitably designed for reducing the energy consumption.

The effectiveness of the proposed work in providing increased energy conservation in the network is depicted by wide ranging simulation results.

To summarize, energy saving is carried out in the current work by choosing proper topology, distance of transmission between sensors. Relevant routing, clustering and appropriate data aggregation techniques are carried out. Assimilation of related data and reducing the volume of traffic are also catered to in the contemporary work. Extensive simulations using Network Simulator (ns-2) shows that the proposed protocol outperforms the existing protocols in terms of reduction in the energy consumption, extending the life of the network and in improving the delivery ratio.