Efficient Data Gathering With Mobile Collectors and Space-Division Multiple Access Technique in Wireless Sensor Networks

A. Abitha, S. Sujatha, A. Stephy

M.E., Embedded system, Sathyabama University, Rajiv Gandhi salai, jeppiaar nagar, Chennai-119, India.

Abstract — To maximize network coverage and to provide a reliable, energy-efficient monitoring depends on selecting minimum number of sensors in active mode to cover all the targets. This power saving technique can be regarded as Set Covering Problem (SCP). Designing for a minimum set of nodes where node selection procedure is based on the energy of each node in a set, provide energy-efficient sensor network. The performance analysis through simulation results show that the algorithm proposed in this paper selects less working nodes than the other algorithms and maximize the network lifetime as well.

Keywords — Mobile Collector, Wireless Sensor Network, SDMA.

I. INTRODUCTION

In the evolving of Wireless Technology the system designers are faced with a challenging set of problems that stem from access mechanisms, energy conservation, a required low error rate, transmission speed characteristics of the wireless links and mobility aspects such as small size, light weight long battery life and low cost.

Flexibility of the mobile terminal can be defined on two levels. First at the level of system operation, flexibility can be defined as the ability of the mobile terminal to support many modes of operation e.g., voice, audio, video, web browsing, GPS, data transmission etc while using the same limited set of hardware. Second at the communication link level, flexibility can be defined as the ability of the mobile device to operate freely in the wireless sensing field.

We consider the problem of gathering data from a sensor network using mobile elements. In particular, we consider the case where the data are produced by measurements and need to be delivered to a predefined sink within a given time interval from the time the measurement takes place. Mobile elements travel the network in predefined paths, node to be collected and deliver it to be sinking.

Each node must be visited by a mobile element that must then reach the sink within the given time constraint. The implement of the project is to plan the paths for the mobile elements that minimize the total length travelled. Several variations of this problem have been considered in existing literature.

II. WIRELESS DISTRIBUTION SYSTEM:

A. Introduction in WDS

A Wireless Sensor System (WSN) is enables in an IEEE 802.11 network. In the encryption method all the base station used in the same frequency. The main challenge is to control the mobility. The path of the sensor nodes path is far away and it has the high power to transmit the data in the higher power levels. These thing in the mobile element in the various fertility. The nodes should be incremented in the wireless sensor network.

Advantages of the wireless distributive system is that of the limitation to be bigger.ant the another major application is emergency response and health monitoring. And it has the power supply should be limited. In the wireless distributive system is support the high bandwidth.

B. Handoff mechanism in mobile SDMA:

A mobile network, a handoff handles subscriber station from one or more base station.it is divided into two hand off. They are soft handoff and hard handoff

1. Soft Handoff

- Soft handoff is used in GSM or CDMA.
- Soft handoff uses a make-before-break approach.
- Application of soft handoff is Internet multiplayer game and video conference, web browsing and e-mail.
- The spectral efficiency result of soft hand off is Lower.

2. Hard handoff

- Mobile SDMA is used in hard handoff.
- Hard handoff uses the break-before-make approach.
- Application of hard handoff is used to voice, data, video.
- In hard handoff, SS switches connection cut to BS and after that only it connect to another station.
3. Issues of WSN
Beyond the basics of WSN routing just presented, there are many additional key issues including:

- Reliability
- Integrating with wake/sleep schedules
- Unicast, multicast and anycast semantics
- Real-time
- Mobility
- Voids
- Security
- Congestion.

III. BROADBAND WIRELESS RELAY STATION
A. Introduction
A relay station is otherwise known as the Radio station and it is used for the base station because it helps the coverage should be improved. A relay station has many names multi hop station and co operative station.

B. Coverage
The data transmission efficiency should be Low in edge network compared to related network. So it has the chance to fail the signal but in this project it should cover the edge cell and it maintain the same frequency signal. And dead spots will be reduced and signal should be strong.

C. Handover
Base station is required to handover and it Forces to making the transmission between the topology. It has the two different method are using such as the inter cell and intra cell handover.

D. Co-operative relay
A relay station should be the set of structures is terms as the co-operative network. Advantages of the co-operative relay is the one path should be damaged another path should be rectified completely and the data is send to that path.

IV. ENERGY EFFICIENT ALGORITHM
A. Node localization
Node localization is very complex used in the WSN and it has the lot of requirement that want to established and it can make it very seriously

B. Block diagram
And the block diagram components are described below

---

Fig. 1 basics of WSN routing.

C. Power allocation
Starting at the root since there is no broadcasting as in RBS, TPSN is expensive. A key attribute of this protocol is that the timestamps are inserted into outgoing messages in the MAC layer thereby reducing non-determinism. Accuracy is in the range of few microseconds. In FTSP, there are radio-layer timestamps, with linear regression, and periodic flooding to make the protocol robust to failures and topology changes in the power allocation. Both transmission and reception of messages are time stamped in the radio layer and differences are used to compute and adjust clock offsets. Accuracy is in the range of 1-2 microseconds.

D. Water filling algorithm
There are three kind of power allocation are used in the water filling algorithm and SNR ratio.

Tabular column of water filling algorithm.

<table>
<thead>
<tr>
<th>Low SNR</th>
<th>Intermediate SNR</th>
<th>High SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Eigen value</td>
<td>Eigen value should be normal</td>
<td>Eigen value should be minimum</td>
</tr>
<tr>
<td>At the time at the power should be sent.</td>
<td>$1 &lt; L &lt; \min (n_T, n_R)$</td>
<td>$\min (n_T, n_R)$</td>
</tr>
<tr>
<td>Increases with $1 \text{bit/s/Hz}$ for every $3 \text{dB}$ increase of $P_T$ power.</td>
<td>Increases with $L \text{bit/s/Hz}$ for every $3 \text{dB}$ increase of $P_T$.</td>
<td>Increases with $\min (n_T, n_R) \text{bit/s/Hz}$ for every $3 \text{dB}$ increase of $P_T$.</td>
</tr>
</tbody>
</table>
E. Kalman filter

A properly designed Kalman Filter allows one to observe only a few quantities, or measured outputs, and then reconstruct or estimate the full internal state of a nodal system. It also provides filtering functions and amplification and can be constructed to provide temperature compensation, common mode rejection, zero offset correction throughout the node. Generate a linear dynamic model. Because Wireless Sensor Network is a set of small and low-cost devices equipped with different kind of sensors.

I. MIMO- Overview

In Mobile Element Path Planning for Time-Constrained Data Gathering, convey the observed data from sensor nodes to a base station, have been introduced for energy efficient data collection in wireless sensor networks (WSNs).

The main challenge in this proposal is how to control the mobility of the mobile elements for efficient data collection while satisfying various constraints. Considering the constraint that the mobile element may not be reachable from every sensor node, the approaches that combine the idea of multi-hop data forwarding (In cellular and wireless networks, wireless communication only occurs on the last link between a base station and the wireless end system.

In multi-hop wireless networks, there are one or more intermediate nodes (so called home points) (multi hop wireless networks can extend the coverage of a network and improve connectivity) along the path that receive and forward Packets via wireless links) and mobile elements have been studied. Here, the data is first aggregated locally using multi-hop schemes to some home points.

Fig. 2 Multi Path Planning

A. Multi antenna architecture

1. MIMO schemes in 16m

SDMA 2.0 supports several advanced multi-antenna techniques including single and multi-user MIMO (spatial multiplexing and beam forming) as well as a number of transmit diversity schemes. In single-user MIMO (SU-MIMO) scheme only one user can be scheduled over one resource unit, while in multi-user MIMO (MU-MIMO), multiple users can be scheduled in one resource unit.

2. SU-MIMO

Single-user MIMO is shortly as the SU-MIMO schemes.

To improve the link performance, by providing robust multiplexing transmissions with spatial diversity, or large spatial multiplexing gain and peak data rate to a single MS, or beam forming gain. Both open-loop SU-MIMO and closed-loop SU-MIMO is supported in 16m. For open-loop SU-MIMO, both spatial multiplexing and transmit diversity schemes are supported.

3. MU-MIMO

Multi-user MIMO (MU-MIMO) schemes are used to enable resource allocation to communicate data to two or more MSs . MU-MIMO enhances the system throughput. Multi-user transmission with one stream per user is supported in MU-MIMO mode. MU-MIMO are also established the MIMO configuration of 2Tx antennas to support up to 2 users, and 4Tx or 8Tx antennas to support up to 4 users. Both unitary and non-unitary MU-MIMO linear precoding techniques are supported.

4. Multi BS MIMO

Multi-BS MIMO techniques are supported for improving sector throughput and cell-edge throughput through multi-BS, network coordinated beam forming or inter-cell interference nulling. Both open-loop and closed-loop multi-BS MIMO techniques can be considered. For closed-loop multi-BS MIMO, CSI feedback via codebook based feedback or sounding channel will be used. The collaborative MIMO (Co-MIMO) and the closed-loop macro diversity (CL-MD) techniques are examples of the possible options. For downlink Co-MIMO, multiple BSs perform joint MIMO transmission to multiple MSs located in different cells.

II. CONCLUSION

WIRELESS SENSOR NETWORKS (WSNs), composed of low cost, low-power, multifunctional sensor nodes. Applications of such WSN are medical treatment, environmental monitoring, outer-space exploration, emergency response, etc. sensor nodes distributed over the field may act as information SOURCES. There is typically one or more SINK nodes for whom the measured data are destined to, which is located within or outside the sensing field.

In order to improve energy efficiency, another efficient way is to maximize throughput without consuming much more power of nodes. MIMO (multiple-input and multiple-output), which is a multiple-antenna technique, is regarded as one of the most promising solutions for improving spectrum efficiency and increasing capacity of wireless systems. If we apply MIMO technique to the sensor network, it will enable more than one sensor nodes to send dissimilar information to the sink node simultaneously with energy efficiency.
REFERENCES


