



A Study of Various Handover Techniques Using MWSN

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Abstract — Wireless Sensor Network, or WSN, has a large amount of applications such as target tracking, health monitoring and security etc. These applications have been proposed for mobile wireless Sensor Network (MWSN). Mobile Sensor node transmits the data with a fixed node in real time applications. MWSN uses various handover techniques which support the mobility of different coordinators. IEEE 802.15.4 is the standard which is used in these approaches and techniques.

Index Terms – WSN; MWSN; mobility; handover; handoff; medium access control protocol

Introduction

A WSN is used to connect two or more self organizing devices. Self – organizing devices is known as sensor nodes. These sensor nodes send and receive the data in the form of signals. Nodes can operate for long period with a limited battery. Wireless Sensor Network (WSN) has wide range of applications like wildlife monitoring and border security, localization and target tracking etc. WSN works with both static and dynamic situation. WSNs use a sink node which is used to collect sensed data [1].

Mobile wireless Sensor Network (MWSN) is also a WSN in which sensor nodes are mobile nodes. It is generally used in these days because it supports real time and reliable communication with nodes mobility. Mobile sensor nodes can move freely in infrastructure network. In MWSN mobility procedure, a mobile node can move in any direction within or without in the range.[2]

Mobility management in WSN is based on the seamless handover (handoff). In MWSN, when data transfers in the network, causes the problem of handover or handoff. Handoff can be classified in two types: hard handoff and soft handoff. Hard handoff allows to communicating only with one AP at one time, it is also known as *break-before-make*. *On the other hand*, Soft handoff allows communicating with multiple APs at the same time, it is also known as *make-before-break*.

Related Work

Mohammad Javed *et al.* in [1], this paper focuses to improve the weak mobility in Mobile Wireless Sensor Network (MWSN). In this paper, IEEE 802.15.4 MAC (Medium Access Control) Protocol is used. It targets to improve the performance based on static and mobile coordinator in beacon enabled mode, using two parameters such as speed and number of beacon orders. This proposed protocol deteriorate the network performance with the help of orphan notification.[4]

Qian Dong and Waltenegus Dargie in [2], in this paper Receiver-Initiated MAC protocol (RI-MAC), were proposed in which a technique is used to improve the associated latency. In this approach most stable link will discover in order to overcome the poor link quality, so that seamless transfer of the data can be made possible. By using proposed technique, it increased the handover latency from 0.006s to 0.026s [3].

Juha Petajajarvi and Heikki Karvonen in [3], proposed was support the mobility management. In previous work, the main focus was on the static WSN, but it does not resolve the problem regarding mobility. This paper focus on, how to manage the handover and addressing of network, where you are using mobile node and mobile gateway. Another target is to reduce the handover in the form of multiple gateways. To overcome this problem, soft handover method based on 6LoWPAN technique is used. SH-WSN6 improves the handover latency performance in static WSN.[5]

Tathagata Das and Sarbani Roy in [4], paper introduce about the mobile sensor nodes and the way how to coordinate if mobile sensor nodes move together to achieve the common goal. To overcome this problem Game Theory Inspired Mobile Object Trapping System (GT-MOTS) is used. This method works when mobile sensor nodes trap the mobile object with exchanging information when sensor nodes move it's also effect on neighbor nodes. It targets to improve the time of trapping with mobile nodes and use neighbor nodes to reduce the collision frequency. [6]

Ehsan Tabatabaei Yazdi *et al.* in [5] the main focus in this paper when data transmits within sensor nodes, some sensor nodes become sleep nodes and lose connectivity. This paper's target is, to provide seamless handover at that time by finding the nearest and new coordinator on the basis of RSSI (Received Signal Strength Indicator without any losing connectivity).[7]

Tathagata Das and Sarbani Roy in [6] this paper presents an algorithm CBMC (Coordination based Motion Control).CBMC mainly used in difficult situation such as military surveillance, intruder trapping etc. CBMC is based on the game theory, by forming the groups. The main work in this paper is, when sensor nodes move together to cover the task, at that time create the network coverage problem. CBMC algorithm improves the coverage with nodes. [8]

Hossein Fotouhi et al. in [8] the aim of this paper reduce the connectivity of network by using fuzzy logic technique. It targets to support and manage the real time mobility. [9]

Different handover Techniques used in MWSNs:

A) RI-MAC (Receiver – Initiated MAC)

It is a seamless handover protocol. The aim of this protocol is to degrade the link quality during transmission of the data, by searching a new relay node without interrupting previous nodes communication. It is an asynchronous duty cycle MAC protocol that used for broadcasting communication. It takes minimum time to send the beacon frames. It has some merits like higher throughput, packet delivery ratio and Power efficiency.

B) Beacon Enabled IEEE 802.11.4 MAC

IEEE 802.15.4 has two layers: Physical and MAC layer. It has some applications like low data rate, cost and power. IEEE 802.15.4 uses two methods to transmit the data. Those methods are beacon enabled mode and non-beacon enabled mode. In beacon enabled mode, super frame slotted is used and non-beacon mode uses unslotted frames for transmitting the data.

In PAN, also support the beacon enable mode and non-beacon enable mode. In beacon enable mode data receive in beacon frames, beacon frame depend on the value of beacon interval.

C) There are two techniques used to support mobility management. Handover and soft handover for WSN based on 6LoWPAN:

1) *Handover based on 6LoWPAN:* In WSN, data transfer continuous form such as audio or video. In this Internet Control Message Protocol (ICMP) used to manage the unnecessary handover in different Gateways (GWs). Firstly, SN has only one GW, it checks that the node is already registered or not. If not, SN transmits the message for registration to the GW. It uses only single gateway.

2) *Soft handover based on 6LoWPAN:* Soft handover used to overcome the weakness of handover H-WSN6, if data transmit in multiple Gateways. SN takes a new registration for a new Gateway and deletes it previous registration that's why creating unnecessary handover also increases the chances to lost the connection. In SH-WSN6, two or more multiple gateways are used to improve the quality of service and connectivity of network.

D) GT-MOTS

GT-MOTS (Game Theory Inspired Mobile object Trapping System) exploit the Wireless Sensor Network in the form of Objects. It has some real time applications such as military surveillance,

object tracking etc. GT-MOTS used the cooperative Game Theory (CGT), it is a part of game theory. CGT where sensors are allowed to share the decision and information of nodes. PEG (Pursuer Evasion Game) is mainly used in mobile object trapping. GT-MOTS share the information of sensor nodes with neighbor nodes. It has some merits like improve the time of trapping, reduce the collision frequency.

E) Blind Scheme

This scheme uses IEEE 802.15.4, it chooses the new and nearest Access Point (AP) on the basis of sensor nodes. In this scheme RSSI (Received Signal Strength Indicator) is used to calculate the distance of neighboring access points and also depend on the movement direction then choose the best access point. Sensor nodes choose that value which provides the prolonged connection without any interruption and without losing any packets.

Conclusion

In this paper, there are various handover techniques available to reduce the unnecessary handover in real time applications of mobile wireless sensor network. The main focus of these techniques is, to transfer the data without losing any connectivity, to make the network more reliable and effective packet delivery ratio.

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