Concept of Packet Transmission Delay Mechanism for Wireless Sensor Systems

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Abstract. Wireless body sensor systems (WBSSs) are an area drawing attention owing to recent commercialization of wearable devices; WBSSs deliver information and provide services using sensors attached to a user. In order to overcome sensors’ small battery problems and dynamic wireless situation, this paper intends to judge oscillation in a wireless situation using acceleration values and to propose an algorithm inhibiting packet transmission according to the degree of oscillation.

Keywords: Wireless body sensor system, Acceleration, Packet delay, Energy saving.

1 Introduction

Wireless body sensor systems (WBSSs) are to attach sensors to a user, thereby quickly notifying the user of his or her exercise amount, health, and location information and providing diverse services, and are largely used in the medical and exercise fields.

Sensors used in a WBSS have constraints in battery size and weight and therefore a lot of research is being performed to reduce battery consumption. In addition, the wireless channel situation may be very changeable. In other words, due to the location where the user puts on the sensor, the space where the user is located, and changes in the user’s movements, the wireless channel situation changes from moment to moment.

Existing research made efforts to adapt to an unstable wireless situation by sending packets even when the wireless condition was unstable. However, excessive packet transmission in an unstable wireless situation increases total energy consumption. Accordingly, this paper aims to judge a wireless situation with acceleration values in the process of sending packets and if it is judged that the wireless environment is unstable, inhibit packets, thereby reducing packet loss and transmission of control packets and resultantly obtaining efficiency in total energy. In addition, this study

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aims to identify packet delay time triggered by inhibiting packets, examine energy efficiency according to such delay time, and look at whether energy efficiency is optimal according to packet delay time in the experimental environment of this paper.

2 Relevant Works

Studies aimed at overcoming wireless signals oscillating and becoming smaller due to the locations of sensors and the user’s movements in wireless body sensors have been conducted [1][2]. Among them, studies of transmit power control (TPC) algorithms are representative studies to increase energy efficiency. [3] explains the content of existing received signal strength indicator (RSSI) control. The sink node measures RSSI, and if the RSSI value goes beyond the target RSSI margin, it calculates the new TPL value obtained by performing TPC algorithm and transmits it through a control packet. Representative TPC algorithms include linear algorithm [4], binary algorithm [5], and dynamic algorithm [6]. Explanation on the algorithms in detail goes beyond the scope of this paper and therefore the authors will omit explanation on them. [7] studied a method to perceive a fall using an acceleration-based self-constructing classifier. This algorithm learns information on positive and negative cases and makes classification using the learned information. [8] proposed a method to estimate a user’s poses based on an acceleration-based wearable sensor system. The research captured marker-based motions and utilized partial least square regression analysis. However, [7][8] did not judge the current wireless situation using an accelerator.

3 The Proposed Algorithm

The ultimate goal of the algorithm this paper intends to propose is to increase total energy efficiency by inhibiting packet transmission when the wireless channel condition is judged to be unstable. Therefore, if the waiting time of data packets is shorter than the set deadline, the Ack packets whose length is shorter than data packets will be transmitted while inhibiting transmission of data packets. If the waiting time of data packets is longer than the deadline, all the packets that stood by longer than the deadline will be transmitted. The reason for transmitting Ack packets is to inform that transmission of packets is inhibited because the current wireless situation is not good. Figure 2 shows the flow chart of the proposed algorithm.

4 Conclusion and Future Research

Thus far we judged a wireless situation using acceleration values, and designed an algorithm inhibiting packet transmission in an unstable wireless situation and transmitting packets when the wireless situation was stable. Future research will embody this algorithm and experimentally analyze its performance result.
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**References**