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RESEARCH ARTICLE

Friendship Degree and Tenth Man Strategy: A New Method for Differentiating Between Erroneous Readings and True Events in Wireless Sensor Networks

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ABSTRACT Event-driven Wireless Sensor Networks (WSNs) consist of thousands of tiny nodes. Sensor nodes are prone to faults because of their fragility and the fact that they are typically placed in harsh environments. Erroneous readings pose a high risk in many situations and affect the network's reliability, necessitating a solution to distinguish between true and faulty events. In response to this challenge, this work proposes the Friendship Degree and Tenth Man Strategy (FD-TMS) method for true event detection in WSNs. This new method can differentiate between erroneous readings and true events in a distributed manner. The FD idea has previously been used to solve security problems, while military intelligence operations have inspired the TMS and have never been used in WSNs. The FD-TMS consists of two stages. In the first stage, it employs a majority voting approach considering the friendship degree among voters. Voting among only trustworthiness nodes with high FD values will effectively differentiate true events and incorrect measurements. The second stage will validate the voting process through a novel perspective based on the TMS. TMS will check the voters' replies based on the event's location. The proposed method will delete erroneous readings, while only the true event reports will be reported. FD-TMS was comprehensively assessed in a simulation environment utilizing a performance analysis tool constructed on Java. The results were compared to the baseline algorithm, highlighting key parameters like false alarms and event detection accuracy. The simulation results demonstrated the proposed approach significantly enhanced the performance of the baseline works.

INDEX TERMS Event-driven, friendship degree, measurement faults, tenth man strategy, wireless sensor networks.

I. INTRODUCTION

The main goal of the Fourth Industrial Revolution (IR 4.0) is to create an industrial environment that is smarter and better connected, which can make industries more competitive and improve the economy [1]. There are a lot of different technologies within IR 4.0, such as cloud computing, cybersecurity, intelligent machines, modeling, and simulation [2]. The Internet of Things (IoT) and Wireless Sensor Networks (WSNs) are powerful technologies that make the environment and objects smarter. These technologies are considered as the backbone of IR 4.0 [3]. Furthermore, these technologies have been in great demand in recent years due to their capabilities. By 2025, the expected number of sensors that

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