ARTIFICIAL NEURAL NETWORK APPLICATION FOR ERROR ESTIMATION IN WIRELESS SENSOR NETWORK

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Abstract - This paper comes up with an error estimation model for Wireless Sensor Nodes„ the integrity of data received after transmission within a signal coverage range less or equal to 45 meters is analysed, Neural Network linear regression method was used to evolve resolve equation that compares error with weight of data received as $\delta e(w)$ against δw_{ij} , an equation for error rate was also evolved after carefully comparing between data packet transmitted and Packet received, error rate e_r for sensor node was calculated to be 0.00918 thereby establishing the fact that expected packet to be received for every data transmitted is the product of e_r and Packet Transmitted.

Keywords - Packet, Data, Neural Network, Wireless Sensor Nerwork

I. INTRODUCTION

Wireless sensor networks (WSNs) consist of the following set of sensor nodes that can communicate with each other; sensors that measure a desired physical quantity; and the system base station for data collection, processing, and connection to the wide area network. Modern wireless sensor nodes have microprocessors for local data processing, networking, and control purposes [1,5]. WSNs have enabled numerous advanced monitoring and control applications in environmental, biomedical, and numerous other applications. Sensors in such networks have their own dynamics (often-nonlinear), and modeling such a sensor network is often not trivial. Because recurrent neural networks (RNNs) consist of interconnected dynamic nodes, we explore their similarities with WSNs and exploit those similarities in WSN modeling. This paper presents the modeling of WSNs using a forward propagating RNN.[4]Wireless Sensor Networks (WSNs) are characterized by collaborative information transmission from multiple sensor nodes observing a physical phenomenon [1]. Compare to conventional network systems, WSN can be applied to more wide range of regions, such as forest, valley, farmland, and so on. [5]One of the main challenges in adoption and deployment of wireless networked sensing applications is ensuring reliable sensor data collection and aggregation, while satisfying the low-cost, low-energy operating constraints of such applications. A wireless sensor network is inherently vulnerable to different sources of unreliability resulting in transient Failures However, for high error rate of wireless channel and severe energy constraints of battery-powered sensor nodes, the implementation of WSN is a challenging task. The average bit error rate (BER) of wireless channel fluctuates widely, varying from 10^{-6} to 10^{-1}, to recover error packets, there are two basic methods: Automatic Repeat Request (ARQ) and Forward Error Control (FEC). ARQ supposes a receiver will acknowledge a message from a sender, and the sender will retransmits the message if it is not acknowledged within a certain time. FEC uses redundant information along with the data bits to recover the damaged packets, as no acknowledgements are sent to the original sender, the packet will be lost when the error is uncorrectable. Since, in wireless sensor networks, packets are commonly broadcast over shared channel and forwarded over multiple hops, using FEC is preferable because it can reduce the need to retransmit data packets, thereby reducing the power consumed in the process [1,2]

However, such devices are vulnerable to various sources of errors Hence, providing reliable data collection and aggregation has become paramount concern for deploying such sensor applications.

A wireless network of sensor nodes is inherently exposed to various sources of unreliability, such as unreliable communication channels, node failures, malicious tampering of nodes and eavesdropping. The sources of unreliability can be classified into two categories.[1]

Soft failures occur in wireless channels as transient errors, caused by noise from various sources, such as thermal noise at the receiver, channel interference and multi-path fading effects and electromagnetic interference.[4\

II. DESIGN METHODOLOGY

This work adopts the neural network application using the forward propagation method the sensing nodes are referred to as Reduced Functional Device this include the source node and the intermediary node while the FFD which is referred to Full Functional Device is is the Final sink node, where all data converges and are collected for further processing. We come up with a design where the data is a function of weight w and input value x