DEVELOPMENT OF A MULTI-MODEL SENSOR NODE WITH DATA RECOVERY ABILITY TO MONITOR ENVIRONMENTAL FACTORS WHICH COULD BE USED FOR FOREST FIRES DETECTION

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Master's Degree

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DECLARATION

I declare that this is my own work and this Thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: UOM Verified Signature Date: 30/04/2024

The supervisor should certify the Thesis with the following declaration.

The above candidate has carried out research for the Master's Degree Thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: K V D S Chathuranga

Signature of the Supervisor: UOM Verified Signature Date: 01/05/2024

DEDICATION

To my loving parents, your unwavering support and boundless love have been the driving force behind my journey, and I dedicate this to you with deep gratitude and profound appreciation.

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I am profoundly grateful to my supervisor, Dr. Damith Chathuranga, for the unwavering support, guidance, encouragement, and patience he extended throughout this research endeavor. Beyond being a conventional supervisor, he assumed the role of a mentor, comprehending my strengths and offering the necessary guidance and advice that played a pivotal role in the success of this research. I hold a deep appreciation for his invaluable dedication of time and expertise to my growth and development.

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ABSTRACT

Forest fires induce significant threats to ecosystems, human lives, and the climate. Human activities, fuel accumulation, and climate change are the primary factors contributing to their occurrence. To effectively manage and prevent the spreading of forest fires, it is essential to take support from improved forest fire monitoring systems. Existing fire detection systems have limitations, including high costs, limited coverage, and false alarms. Wireless Sensor Networks offer a promising solution due to their ability to cover large areas, provide rapid response, and collect relevant ambient data. This research proposes the design and development of a multi-model sensor node for forest fire detection. The sensor node integrates temperature and humidity sensors, along with a communication system and data recovery method. An artificial intelligence-based algorithm is employed for fire detection. The performance of the sensor node detection algorithm is evaluated through experiments. Also, the system life, data recovery ability, and packet loss of the sensor node are also evaluated experimentally. As the results of these evaluations, there is a system life of more than 4 years, excellent recovery ability for sensor module failure, and promising fire detection ability for a 30 cm x 30 cm wide artificial fire with 2 Kg of forest fire fuel compared to the existing systems giving better deployment ability.

Keywords: forest fire detection, wireless sensor nodes, artificial intelligence, multi-AI

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