|  |  |  |  |
| --- | --- | --- | --- |
| **Title:** | Design, Simulation, and Implementation of an IIoT-based Temperature and Humidity Monitoring System with Single-Core Infinite Loop Prevention and Fault Tolerance for Multi-Sensor and Connectivity Failures | | |
| **Author(s) Name:** | Christopher Andrew Guda, Jamiul Hasan, Sanour Islam, Md. Sahebur Rahman, and Muhibul Haque Bhuyan | | |
| **Contact Email(s):** | muhibulhb@aiub.edu | | |
| **Published Journal Name:** | Proceedings of the 7th International Conference on Innovation and Technopreneurship (ICIT2025) | | |
| **Type of Publication:** | Conference Proceedings | | |
| **Volume:** | 7 | Issue | - |
| **Publisher:** | INTI International University, Malaysia | | |
| **Publication Date:** | 11 September 2025 | | |
| **ISSN:** | - | | |
| **DOI:** |  | | |
| **URL:** |  | | |
| **Other Related Info.:** | Conference Website: https://icit2025.newinti.edu.my  Place: INTI International University, Malaysia, Conference Date: 11 September 2025. | | |
|  | | | |

|  |  |
| --- | --- |
| **Abstract:** |  |
| Abstract—The purpose of this research is to develop and implement a robust monitoring system that can function with the constraints of a single-core processing system, such as an ESP 8266, to overcome the issue of infinite loop faced when one or more subsystems malfunction, such as the loss of data or server connectivity. This paper describes a novel approach wherein the implementation of an Industrial Internet of Things (IIoT) based temperature and humidity monitoring system resolves the infinite loop issue and enables the development of highly robust monitoring solutions. The output from such a system can be subsequently integrated into other systems that can respond to the monitored values in real time without disruptions. The proposed mechanism utilizes an ESP8266 microcontroller for processing and wireless connectivity, DHT22 sensors for temperature and humidity measurements, an LCD for real-time monitoring, and the Message Queuing Telemetry Transport (MQTT) protocol to store data in the Adafruit IO platform for live off-site monitoring and data storage. Testing demonstrated that the system could handle up to three sensor failures out of four, Wi-Fi network and server disconnections, and automatic reconnections after five seconds. The system was able to perform error handling while maintaining the data flow from the sensors to the local data display LCD without interruptions during all tested scenarios. Based on several trials, the system succeeds at addressing a wide range of errors and disruptions, resulting in an ideal solution for the sectors that require precise monitoring to attain a wide range of operational objectives. | |