Efficient Data Communication in LoRaWAN with Huffman Coding and Threshold Control

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Global warming has led to more frequent heavy rainfall, increasing the risk of floods on various scales. Early detection is crucial for timely evacuations, particularly in forested areas that are often affected first. To address this, we propose deploying sensor networks in forests and mountains using LoRa-WAN, which supports long-term operation with sustainable energy sources.

The primary goal of our proposition is to reduce energy consumption by employing efficient data compression techniques, such as Huffman encoding and run-length compression. These methods address LoRa-WAN's 11-byte payload limitation while optimizing transmission efficiency. Since data transmission consumes significant energy, thresholds will be set for each sensor to transmit data only when readings exceed these limits, further reducing energy use.

The experiment will be evaluated by comparing the compression ratio and power consumption between standard data transmission and compression methods, using programmable Arduino sensors to send data over LoRa-WAN. This approach is not limited to precipitation data and can be extended to other sensor types, such as fire or earthquake monitoring, supporting future disaster countermeasures.

References

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