ARIA
APPLIED RESEARCH IN ACTION

Data Communication Optimization Between Mobile Devices and Servers

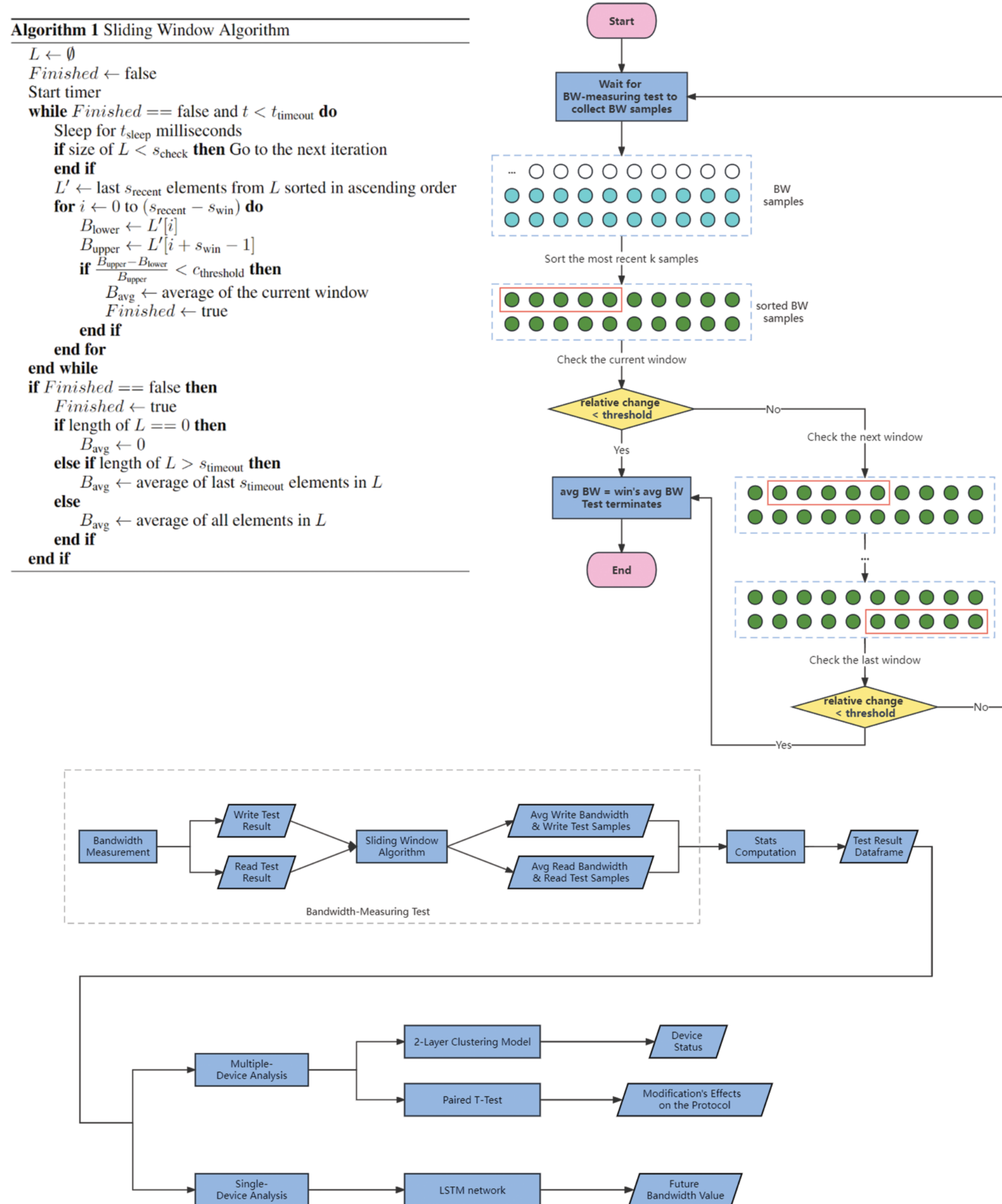## Insight of Enhancing Protocol Performance Through Bandwidth Analysis and Predictive Modeling

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PROJECT SUMMARY

This study aims to assess the performance of a protocol through a comprehensive framework combining bandwidth tests and advanced analytical techniques. The research question centers on assessing the effectiveness of protocol modifications and analyzing and predicting the performance of devices based on the bandwidth value. Using a dynamic Sliding Window Algorithm for processing bandwidth samples, the study accurately estimates the average bandwidth for each device during transmission and reception. Statistical metrics like variation and outliers are computed, leading to both multiple-device and single-device analyses. A Two-Layer Clustering Model is designed to cluster device statuses and identify subpar performance, while a Long short-term memory (LSTM) network is proposed to predict future bandwidth values. The impact of modifications is evaluated via paired t-test and effect size calculation. Experimental validation includes monitoring devices with low bandwidth for clustering accuracy and testing prediction accuracy using actual bandwidth values. The proposed methods evaluate modifications' effects on the protocol, providing insights into enhancements for future development. In conclusion, this research employs bandwidth testing and sophisticated analysis to offer deep insights into protocol performance and modification efficacy, contributing to a comprehensive understanding of performance characteristics in varying scenarios.

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