Transfer of Technologies for Performance Degradation Prediction and Channel Switching in Vehicular Networks under Harsh Weather Conditions and Integration with State-of-the-Art Products

Technology Transfer Activities

by

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TECHNOLOGY TRANSFER ACTIVITIES

1 Outputs

We submitted two conference papers, both of which are under peer review. Below is our plan to disseminate the research results.

1.1 Future Output

Peer-Reviewed Article:

Currently, we have two conference articles under review.

“Development of Predictive Mathematical Model for Millimeter Wave Degradation in Sandstorm Regions”. Submitted to 12th IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE 2024).

“Switching Millimeter Wave Channels Using Fuzzy Controller System”. Submitted to 14th IEEE International Conference on RFID Technology and Applications.

2 Outcomes

The research has produced the following critical outcomes:

We develop a comprehensive mathematical model to predict the degradation of millimeter wave signals in dusty storm conditions, incorporating factors such as particle size distribution and storm intensity. The model provides a detailed analysis of how dust and sand in the atmosphere affect signal attenuation and phase shift, offering critical insights for network design in dust-prone regions.

Our second part introduces a novel fuzzy controller designed to manage 5G millimeter-wave channel switching efficiently under different environmental conditions like rain and dust. Our research demonstrates how the controller intelligently selects from five different frequency bands based on real-time environmental data such as visibility and rain intensity. Through extensive simulations, our work proves that this approach significantly enhances connectivity reliability

3 Impacts

This study aims to enhance wireless communication capabilities under adverse weather conditions by improving the reliability and connectivity of vehicular networks. Our channel-switching approach offers significant improvements in the reliability and effectiveness of vehicular networks compared to traditional methods.