National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Performance Analysis of Resource Allocation Algorithms for Vehicle Platoons over 5G eV2X Communication.
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Venue	: EC303, Seminar Room
Date and Time	: 20 Jan 2025 (05.15PM)
Abstract	: Vehicle platooning is a cooperative driving technology that can be supported by 5G enhanced Vehicle-to-Everything (eV2X) communication to improve road safety, traffic efficiency, and reduce fuel consumption. eV2X communication among the platoon vehicles involves the periodic transmission of Cooperative Awareness Messages (CAMs) containing vehicle information under strict latency and reliability requirements. These requirements can be maintained by administering the assignment of resources, in terms of time slots and frequency bands, for CAM transmission in a platoon, with the help of a resource allocation mechanism. State-of-the-art on control and communication design for vehicle platoons either consider a simplified platoon model with a detailed communication architecture or consider a simplified communication delay model with a detailed platoon control system. Departing from existing works, we have developed a comprehensive vehicle platoon communication and control framework using OMNET++, the benchmarking network simulation tool. We have carried out an inclusive and comparative study of three different platoon Information Flow Topologies (IFTs), namely Car-to-Server, Multi-Hop, and One-Hop over 5G using the Predecessor-Leader Following platoon control law to arrive at the best-suited IFT for platooning. Secondly, for the best-suited 5G eV2X IFT, we have analyzed the performance of three different resource allocation algorithms, namely Maximum of Carrier to Interference Ratio (MaxC/I), Proportional Fair (PF), and Deficit Round Robin (DRR). Exhaustive system-level simulations show that the One-Hop information flow strategy, along with the MaxC/I resource allocation, yields the best Quality of Service (QoS) performance in terms of latency, reliability, Age of Information (AoI), and throughput.