

Research on Real-time Robust and Secure Communications for Vehicular Ad Hoc Networks

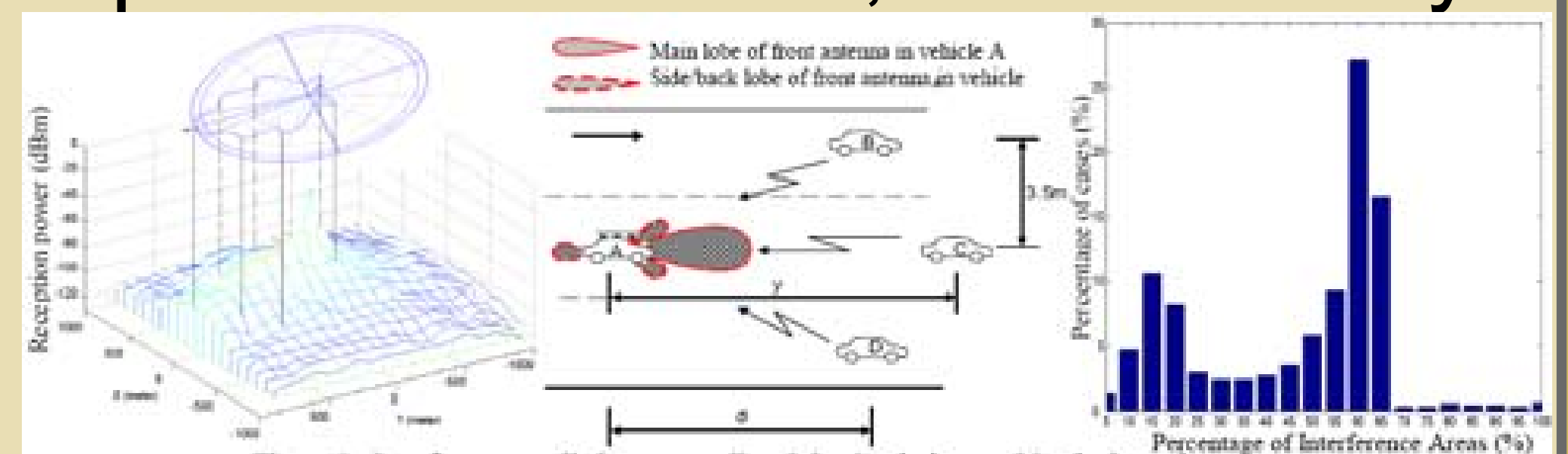


Chunxiao (Tricia) Chigan (<http://www.ece.mtu.edu/ee/faculty/cchigan>)

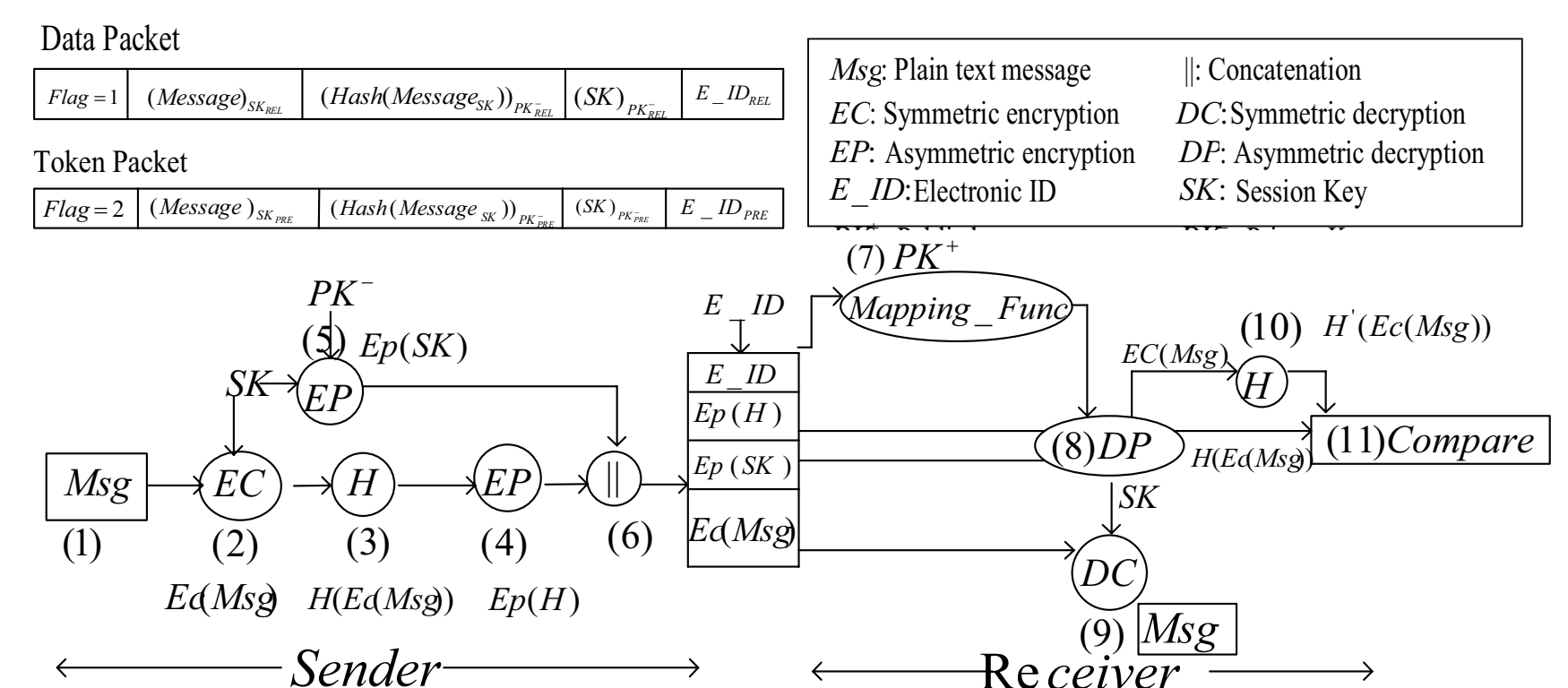
This CAREER project is motivated by the belief that Vehicular Ad Hoc Networks (VANETs) based inter-vehicle communications could enhance traffic safety and traffic operation. VANET networks differ from general mobile *ad hoc* networks (MANET) because of the stringent requirements on real-time, robust and secure communications and coordination in a critical highly dynamic environment. Building on research concerning **run-time static relative-position relation** among neighboring vehicles, this project addresses the major challenges in access technology, dynamic power control, robust multi-hop communication, and security and privacy provisioning.

The success of this project will open the door for many new applications such as:

- ❖ Traffic safety
- ❖ Cooperative traffic operation
- ❖ Vehicle probe data acquisition
- ❖ Information sharing
- ❖ Opportunistic pervasive communications



Antenna directivity & wireless multipath channel



Countermeasure uncooperative behaviors w/ DTT

Approach and Impact

New approach

- Collision-Free Relative Position Based MAC Nucleus (RPB-MACn)
- Delay-Bounded Dynamic Interactive Power Control
- Mobility Predication Augmented Robust Message Dissemination
- Dynamic Trust-Token Approach; Relative Position based Dynamic Address Assignment & Mapping

Research Impact

- Enable real-time and robust hop-to-hop communication in highly dynamic VANETs
- Agilely cope with segmentation and limited capacity problems at all vehicular traffic loads
- Enhance robust multi-hop communications in the presence of fragmentations
- Enforce cooperation at low delay; Balance Security & Privacy

In particular, this project will develop new approaches to access technology enabling high channel availability over dynamic multi-path wireless channel, delay-bounded dynamic power control augmenting real-time communications over high mobility, robust multi-hop message disseminations in the presence of frequent fragmentations, and security implementation promoting cooperative communication and balancing privacy and security.