Real-Time Modeling for Intrusion Detection in Automotive Controller Area Network

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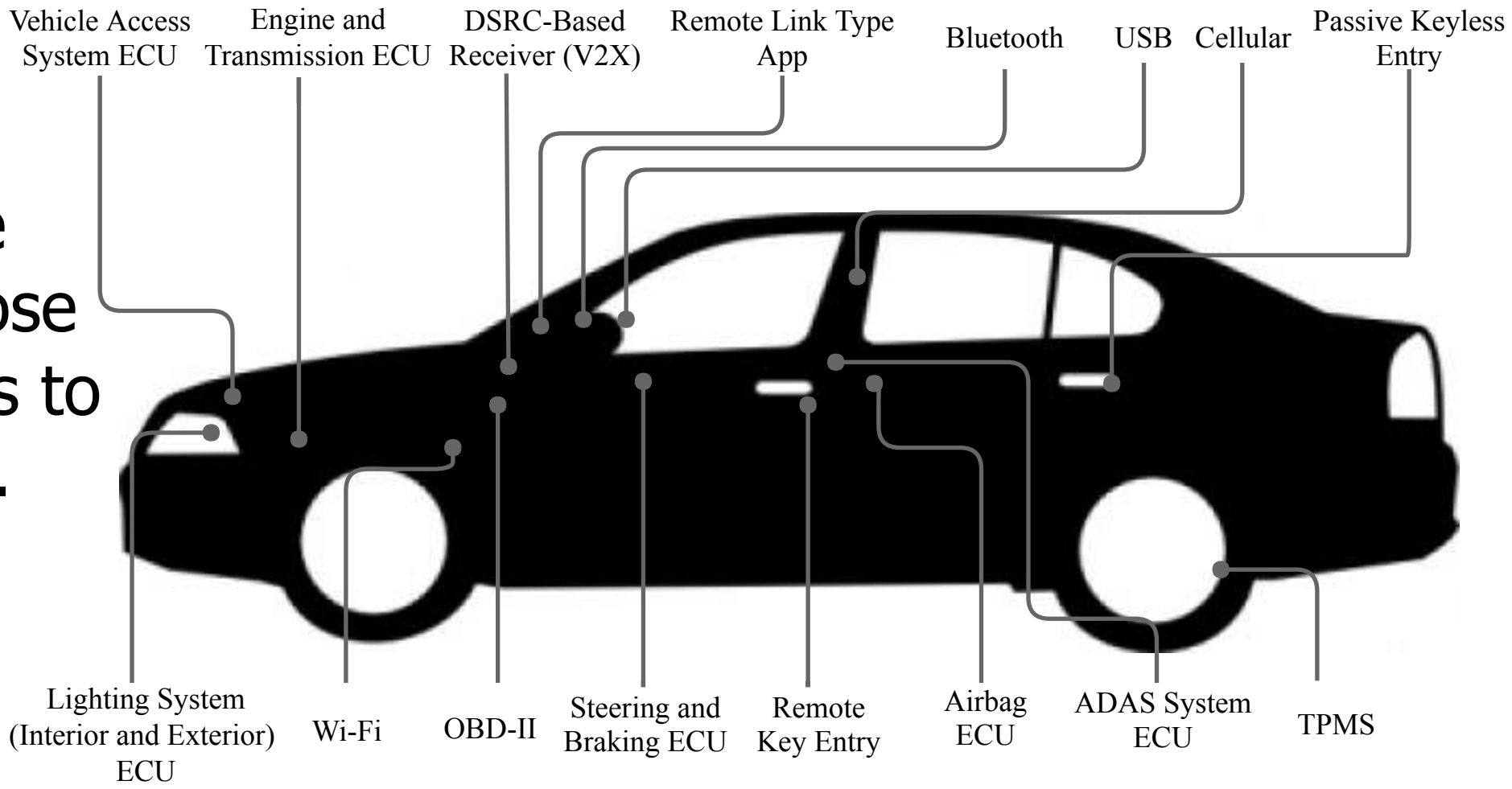
RTSS 2018, Nashville, TN

Motivation

Interconnection of the automotive in-vehicle network with the outside world poses a significant security risk.

Modern vehicle interfaces expose driving systems to **cyberattacks**.



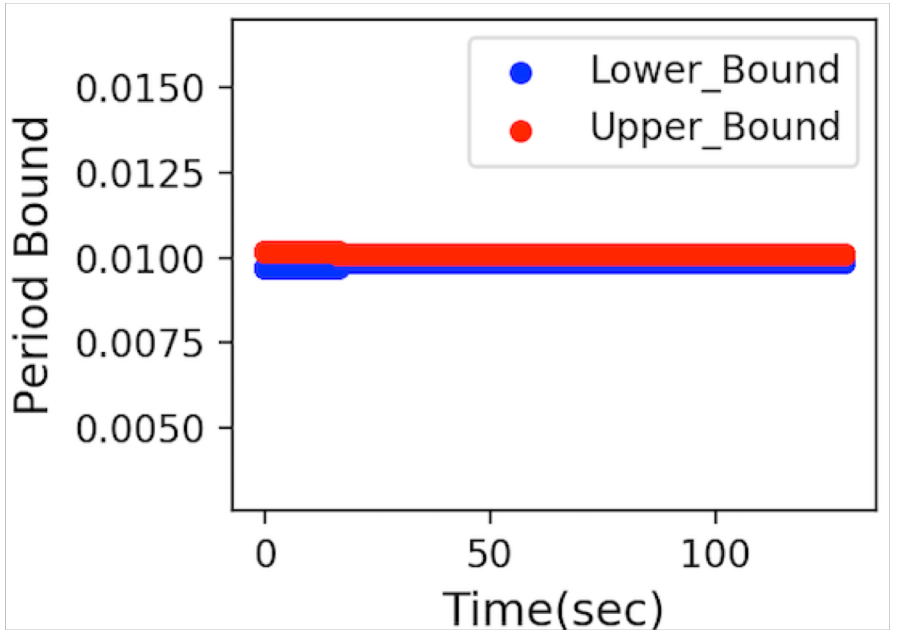
Approach

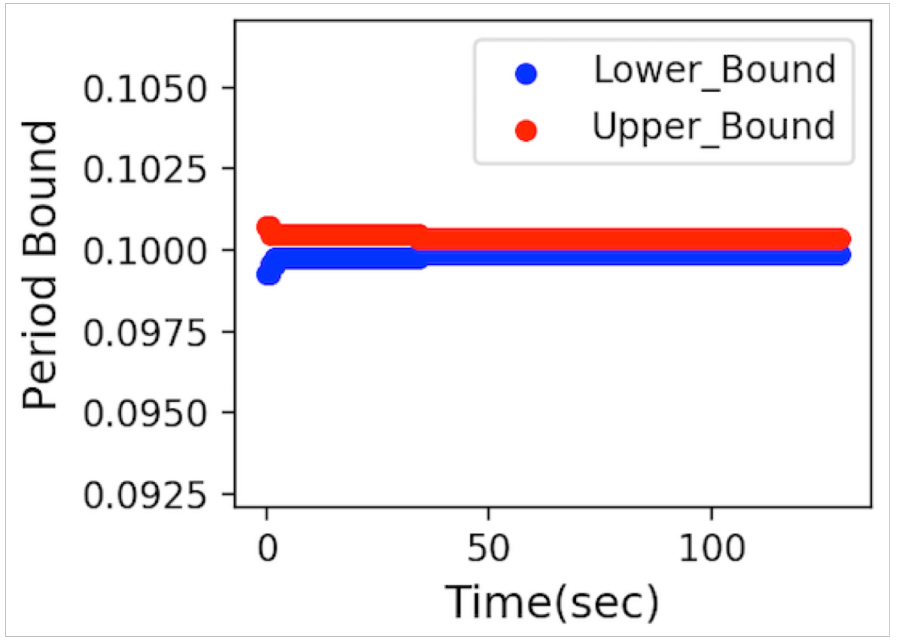
Timing Model Reconstruction

We observe CAN messages and infer real-time model parameters (periods) iteratively.

Specification-based IDS

We use inferred periods with response time analysis as a specification of the normal behavior to detect injected messages.





Preliminary Results

Cars	TN	FP	FN	TP	Precision	Recall
X	485467	624	620	6331	0.91	0.91
	323666	276	152	1672	0.86	0.92
	241056	101	95	2446	0.96	0.96
	246650	91	308	1379	0.94	0.82
	239047	60	208	2424	0.98	0.92
Y	345451	330	130	1019	0.76	0.89
	327310	294	122	2433	0.89	0.95
	381383	524	230	1933	0.79	0.89
	337086	489	1	1293	0.73	0.99

Conclusion and Future Work

- We propose a specification-based intrusion detection system for automotive in-vehicle networks.
  - Uses response time analysis of CAN as the specification
  - Estimates message periods online in a black-box approach
- We have evaluated our approach experimentally on datasets generated from the CAN busses of two different cars.
- We are improving our algorithms and real-time model to reduce false positives and accommodate aperiodic messages.