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CYBER SECURITY FRAMEWORK FOR VEHICULAR NETWORK BASED ON A HIERARCHICAL GAME

ABSTRACT

The growth of electronic devices in connected vehicles and their connections to the untrusted network, present unprecedented exposure to attacks. Therefore, a reliable and efficient cyber security framework is mandatory to protect vehicular networks against the cyber attackers. Thereby, we propose a cyber defense framework based on a hierarchical cooperative game to secure legitimate vehicles from attacks. In the proposed hierarchical game, there are two kinds of players, the head agent and secondary agents that cooperate between each other to detect, predict and react efficiently against suspected attacks. The Intrusion Detection System (IDS), Intrusion Prediction System (IPS), and Intrusion Reaction System (IRS) represent the secondary players, where their strategies are to carry out the detection, prediction and reaction actions, respectively. The Intrusion Decision Agent (IDA) is the head player and is responsible for making decisions in launching the strategies of IDS, IPS and IRS players. The secondary and head agents are to collaborate in order to decrease the false positive and false negative rates, while minimizing the processing delay and overhead. Numerical results show that, our cyber defense game requires low communications overhead and low delay to achieve low false positive and false negative rates as compared to the current intrusion detection and prediction frameworks.