RFID Tag Localization for Tires using Support Vector Machine Learning

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Radio frequency identification (RFID) tags are often attached to or embedded inside a large number of items within the coverage range of an RFID reader. Reader antennas have very broad patterns, so it has been a major challenge to locate a particular tag that has been detected by the reader. Algorithms have been developed based on propagation modeling, but these approaches are limited to relatively simple environments (S. Shao and R. J. Burkholder, IEEE Sensors Journal, 13, 3767-3774). Machine learning, on the other hand, is able to take large amounts of training data and categorize into groups for decision making purposes, independent of any *a priori* model for the data.

In this paper, a support vector machine (SVM) learning algorithm is applied to RFID tag localization for truck tires. Truck tires on an 18-wheeler, for example, are mounted in groups of four tires (see Fig. 1). An RFID reader placed nearby may be able to read all four tags of a group, but determining which tag is associated with each tire is difficult. The SVM is trained by measuring the received signal strength indicator (RSSI) of the four tags in a large number of different configurations. Four antennas are connected to the reader and tested in different locations to find the optimal deployment for a stationary system and a drive-by system. It is found that the reader antennas need to be positioned on both sides of the tires rather than all on one side. After training the SVM, the algorithm makes a decision based on the data groupings for each tire.

Figure 1. Two sets of dual tires on a truck.