Applications of IoT Technology to Railway Systems for Enhanced Efficiency in Railway Operation

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Recently, IoT technology is gradually applied to many industrial areas including railways because it is very helpful to reduce labor cost in maintenance work. IoT technology such as RF and LTE based wireless communications make the data acquisition during the operation of many systems much easier than before in remote area in real-time. It finally leads to the reduction of maintenance cost during the operation for the end user. This paper introduces two application examples of IoT technology to railway fields. One is a new hybrid measurement system which integrates two different types of sensors such as electrical sensors and optical fiber sensors with IoT-based wireless communication technology. Using this system, optical fiber sensors with many advantages such as long-distance capability, EMI immunity, multiplexing easiness, and etc. can be used as one measurement system together with conventional electrical sensors. The other is a IoT-based remote monitoring system which can measure both internal noise and temperature of railway cars for better comfortableness to passengers in the railway cars. Both systems can be accessed using the dedicated website, which also offers analysis algorithms for required purposes in each system like automatic equivalent-sound-level calculation, and the mobile application in a remote area in real-time worldwide. Performance of those systems are successfully evaluated in the test-bed of commercial railway lines. In the future, it is expected that those IoT-based systems can be utilized as automated measurement and monitoring systems for enhanced efficiency in railway operation by substituting conventional methodology if they are applied to commercial railway lines.