Broken rail detection system through data analysis for train approach based on distributed acoustic sensing technology

Jungtai Kim[1], Hye Yeun Chun[2], Yong Gyu Kim[1], Jae Ho Lee[1], Gil Dong Kim[3]

[1]Train Control and Communication Research Team, Korea Railroad Research Institute, Republic of Korea, [1]Transport System Engineering, University of Science and Technology, Republic of Korea, [1]Smart Electrical and Signaling Division, Korea Railroad Research Institute, Republic of Korea

Distributed Acoustic Sensing (DAS) is a technology that detects ambient vibrations using optical communication. When a signal of a specific frequency is sent to a core of an optical cable and a signal reflected is received, scattering occurs in proportion to the magnitude of the vibration transmitted to the cable, and a variation in the frequency of the signal is used. Through this, it is possible to detect the magnitude of vibration by distance over time. Using this, the railroad field will monitor various situations such as train location detection, wheel flats, and intruder detection. In addition, researches are being conducted to detect rail breakage. When the rail break occurs, the vibration increases when the train passes the area, and can be detected by comparing the magnitude of the vibration. However, since the DAS device detects the magnitude of all the vibrations added around the optical cable, it is unreasonable to conclude that the detected vibration is large. In addition, this method has a disadvantage in that it is possible to determine whether or not the train is damaged only at the moment of passing the train. In this paper, we describe a method for discriminating whether or not there is a breakage by using the specificity of the shape of the magnitude of the vibration that occurs when the train approaches the breakage point.