

7. Development of Detection System Based on Deep Learning for Inspection Information of Sewer Pipes

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Aging sewer pipes have generated growing demand for inspections. While inspections of small diameter pipes have been made more efficient by applying wide-angle lenses to capture images of pipe interiors, the workload imposed by the need to review voluminous image data has restricted progress. To make visual inspections more effective, we developed a detection system based on deep learning for inspection information of sewer pipes.

This system is capable of detecting pipe joints and lateral branch pipes as pipe structures, and detecting cracks, water leaks, and other anomalies as signs of pipe damage based on the images captured. The system can also be used alongside existing inspection systems, allowing the operator to proceed with inspection while monitoring detection results, thereby making inspections more efficient.

Evaluations of detection performance indicate the system can detect pipe structures at success rates exceeding 90% in Recall mode and detect pipe damage at a rate of about 70%. The detection speed is about 15 seconds for a pipe measuring 30 meters in length, thus indicating this system's potential to improve sewer pipe management efficiency.

Key words: sewer pipe, image inspections, pipe structure, pipe damage, deep learning