

Image & Video Analysis

Automated detection of railway defects

Business Challenge

Overland and underground railway track is regularly checked for defects such as loose bolts and broken rail chairs. The entire trackside environment is also monitored for the presence of potentially hazardous debris and damage to assets like signalling and power equipment.

The tried and tested method used since the beginning of the railways is for a sharp-eyed man to “walk” the track and report any problems. Humans are very good at this kind of task but the time taken to walk a route interferes with regular operation of the trains. So, video taken from train-mounted cameras is increasingly used to reduce the “walking time”. But, back at the depot the video still has to be checked frame by frame by a human operator.

SYS Consulting Ltd in collaboration with Snape Signals and Metronet were challenged to develop tools that process the video by automatically searching for specified objects or for changes to the established trackside environment and raising an alert.

Our Solution & Expertise

SYS Consulting has a long record in image processing, with particular strengths in image segmentation, scene understanding and extracting important information from colour and shape within images.

The key feature of the track monitoring task was quickly recognized: that is, the frame by frame images of a track or trackside environment should be almost unchanging over a period of days or even weeks. Therefore, any changes in the image presented at the same location on successive days are grounds for raising an alarm.

With this approach in mind, an automated monitoring system was developed. The first step is to build a model of the image of object(s) of importance. These could be fishplate bolts or a particular trackside transformer. The model is built by “showing” the computer a few examples. It’s even possible to use a stylized model of the object. A computationally efficient search is then made of each video frame for the location that best matches the model. The absence or modified appearance of the object is indicated by a low probability match in frames where high probability is expected, in which case an alarm is raised so that a human operator can take a closer look.

Business Benefits

These techniques have the potential to make the operation of a rail network more efficient because track can be monitored frequently without interference with train operation. It also avoids need for manual examination of large amounts of video, or can be used as a double check on manual examination of video or “track walking” examination. Perhaps most important, the system provides a probabilistic output that can be used to prioritize investigation on particular track faults.

