Plextek

Radar Applications in the Rail Sector

High performance radar could help you solve your challenges in rail safety, transport security or infrastructure surveys.

About Plextek

We have a 30 year history of providing technology solutions to a variety of organisations. Plextek understands today's key challenges for smarter technology development and can generate both the ideas and deliverable solutions to the assured level of security, performance, resilience and ergonomics that you need. We are a product development company that works with clients to achieve results based on their specific requirements.

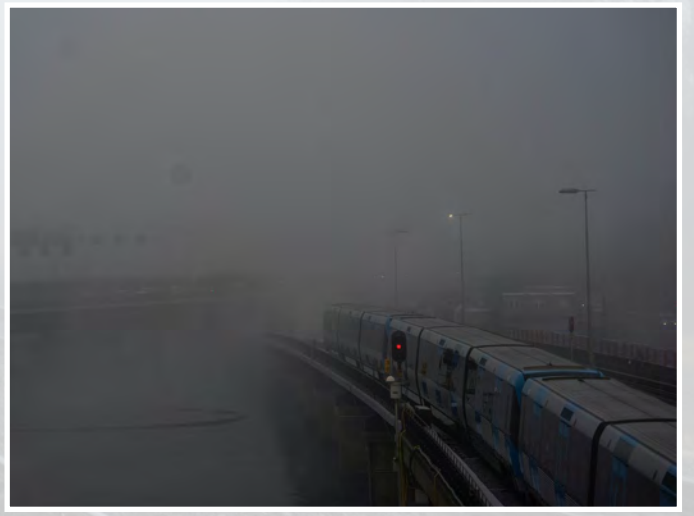
Our engineering experience, supported by our library of IP for key technology elements, aids accelerated time to market and greater cost effectiveness.

Contents

Scanning Radars

Plextek is the leader in the design of scanning radars, which produce a 2D (bearing and range) or 3D (bearing, range and elevation) image of their surroundings. In that respect they are somewhat comparable to LiDAR (Light Detection and Ranging) systems but like all radars they can use Doppler processing to add velocity of the target into the radar image.

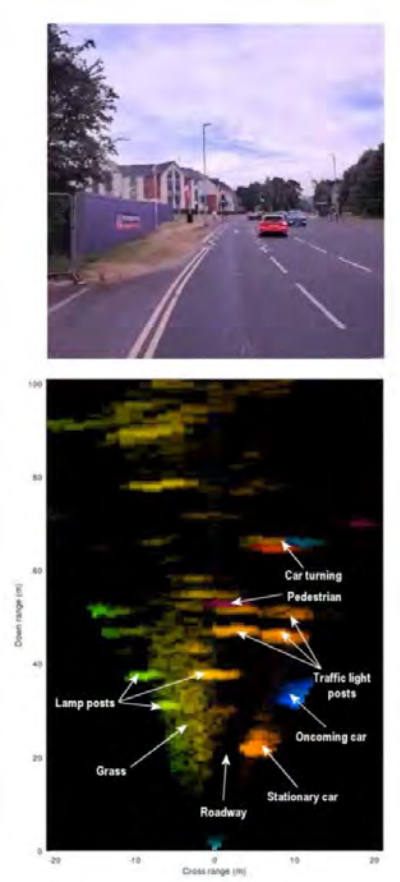
Because radars use RF rather than optical frequencies they work well in all lighting conditions, poor visibility and heavy weather, and never need cleaning. In addition to a rich 2D or 3D image, a radar can readily produce a very simple data set including only targets of interest – for example, only objects that are moving above a certain speed. This can be useful to either reduce the data rate needed to collect radar data from a remote location or to directly control other devices – for example a sense-and-avoid system in an autonomous vehicle.



For some applications, scanning radars work well in combination with cameras, using the radar to detect and track targets, while the camera helps identify or classify the target.

There are many potential applications of radar technology in the rail sector, including surveying, for security and for safety.

Output from a scanning radar

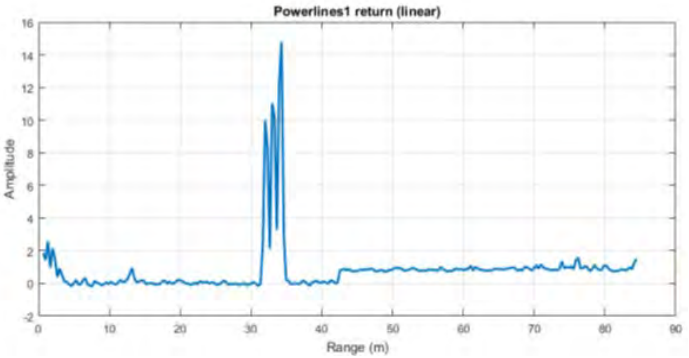


Rail Survey

Using drones for infrastructure surveying is an established technique, but current limitations restrict operations to within line-of-sight of the operator. Autonomous drones would massively increase the utility of drone survey operations. Plextek has pioneered the use of radars to support sense-and-avoid systems, which can prevent collisions between autonomous drones and rail infrastructure and aid safe landing. This opens up the potential for wide ranging drone surveys while retaining the high degree of safety demanded.

Radar can provide a powerful infrastructure survey capability. Ground penetrating radar is a proven tool for inspection of the track bed, for example. Higher frequency radars could be used to inspect the near surface regions of structures that are invisible to cameras, due to a build-up of dirt and grime.

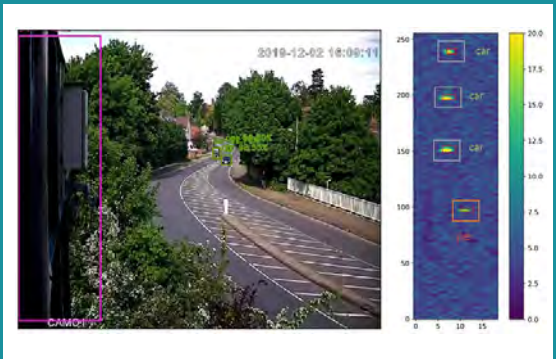
UAV sense-and-avoid radar detecting overhead power lines



Rail Security

Trespassing is a major issue in certain locations on the rail network, particularly near platforms and crossings. A scanning radar is the ideal sensor to detect trespassers.

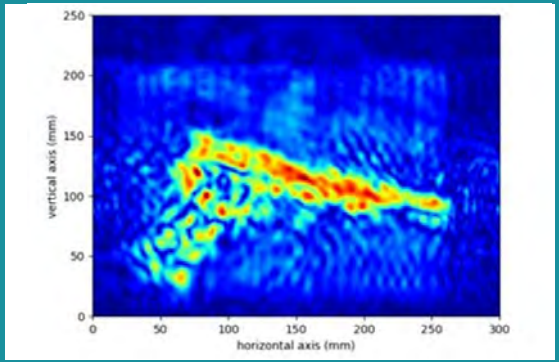
Using Doppler processing to react to only moving objects, it is possible to scan a large 'keep out' area and automatically alert staff if activity is detected. Further specificity can be provided by tracking the route targets are taking. If the radar is used to automatically cue a still or CCTV camera, visible imagery of the event can be captured.



Radar surveillance using a road cueing camera on target detection

Very high frequency radar can be used to detect objects hidden behind surfaces – for example, in seat cushions or behind plastic panels. A hand-held scanner based on these techniques could be used for in-carriage screening.

An alternative implementation could be used to provide basic screening of passengers in areas of high volume flow without creating the impediment to passenger flow that airport-type screening creates.



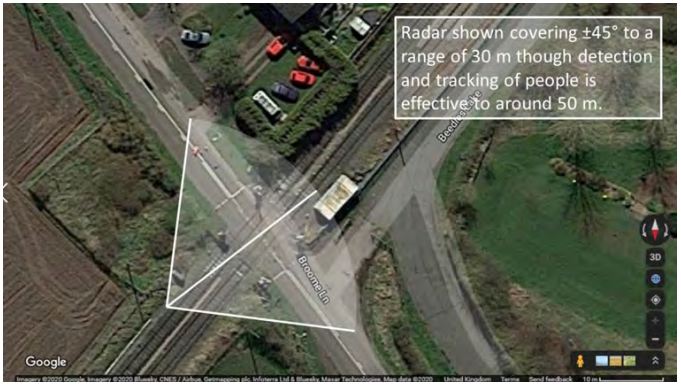
Detection of an object hidden within a seat cushion by mm-wave radar

Rail Safety

A scanning radar is the ideal sensor for detecting and tracking people and vehicles at level crossings, unaffected by weather or visibility conditions and not requiring illumination at night. They can also be used to detect the approach of trains for warning systems at unprotected crossings.

Radars can also be used to assist with worker safety – for example, by automatically scanning and tracking moving targets such as people or plant, within a designated zone. This can be further enhanced by the use of a compact radar transponder that can be worn by a trackside worker or fitted to a vehicle. Each transponder can be coded to provide a unique return to the scanning radar - just like an IFF (Identification Friend or Foe) system used by air traffic radar - allowing all movements to be tracked and alerts raised if boundaries are crossed or safe distances not kept.

A suitable train-mounted radar can detect potential hazards in the proximity of the tracks, somewhat akin to the Foreign Object Detection (FOD) radar systems used at some airports. In this case, a high frequency radar would be used to provide the necessary resolution and the returns would be matched against previous returns for the current section of track.



Scan area of a radar monitoring a level crossing

Detection of roadside objects by vehicle-mounted radar

Plextek expertise: Radar Systems

Plextek designs radars of all types, with operating frequencies from a few hundred kHz up to 100GHz, ranges from tens of centimetres up to tens of kilometres, and resolutions down to less than a centimetre.

We can develop or adapt radar designs for all applications and would love to hear from you to discuss any requirements you have for radar technology.

mm-wave scanning radar with integrated antenna

Integration of radar and vision system on a mobile platform

Plextek

Exceptional technology
to positively impact the future

Get in touch to find out how Plextek can help you
to deliver the next technology innovation in rail.

hello@plextek.com | +44 (0) 1799 533200 | twitter: @plextek | www.plextek.com
The Plextek Building, London Road, Great Chesterford, Saffron Walden, CB10 1NY, United Kingdom

210708-001