RADIX

Digital Radar Clutter Mitigation

Civil and Military airports are equipped with Primary Surveillance Radars to safely manage their air traffic movements and provide radar navigation services to pilots.

An essential tool in ensuring air transport safety, these radars are particularly adept at the detection and tracking of moving targets.

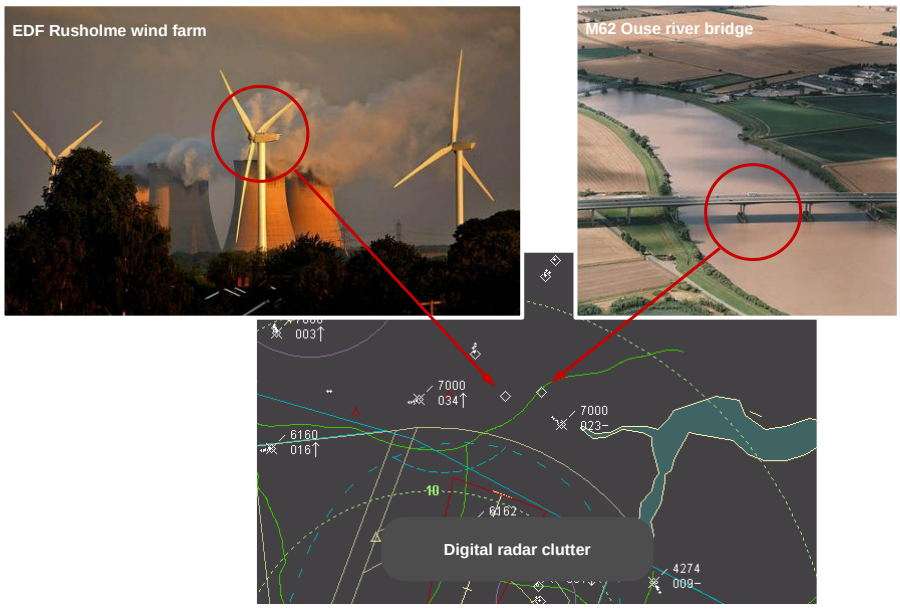
The rotating blades of a wind turbine mimic the radar signatures that these radars are designed to detect, so they can appear in the radar picture as areas of clutter.

In addition, the presence of other, normally benign clutter, such as fast moving road traffic on bridges, may lead to radar tracks jumping, for example between wind turbine and bridge traffic, an effect referred to as: 'Track seduction'.

Solution

To achieve the highest integrity level, throughput and response times, the solution completely avoids mathematical computations. Rather, it is based on parallel assemblies of field-programmable gate arrays (FPGA) and takes advantage of their inherent high speed logic processing to correlate ASTERIX target categories with geographic features:

- Downstream of all radar processing (no interruption of service).
- Upstream of display processing.
- Solution is in the Data Domain.
- Non-computational high speed logic processing (FPGA hardware).
- Based on small, individual, high-precision clutter cells.
- All SSR and Mode S target classes are unaffected.
- Primary only radar targets initiated outside the clutter cells are unaffected.
- Clutter targets (Primary radar only) initiated in the clutter zones are blocked.
- The existing display system sees a 'new radar' with CAA allocated SAC and SIC codes.



All primary Radars perceive the world in terms of range and azimuth cells, which, in modern radars, are then digitally processed for display to Air Traffic Controller's.

This photomontage shows turbine clutter from within the Rusholme wind farm and an instance of radar track seduction onto high-speed road traffic crossing the Ouse River.

The RADIX mitigates both effects and provides a clean uncluttered display for the air traffic controller.

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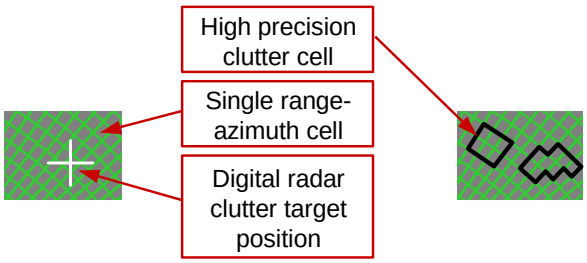
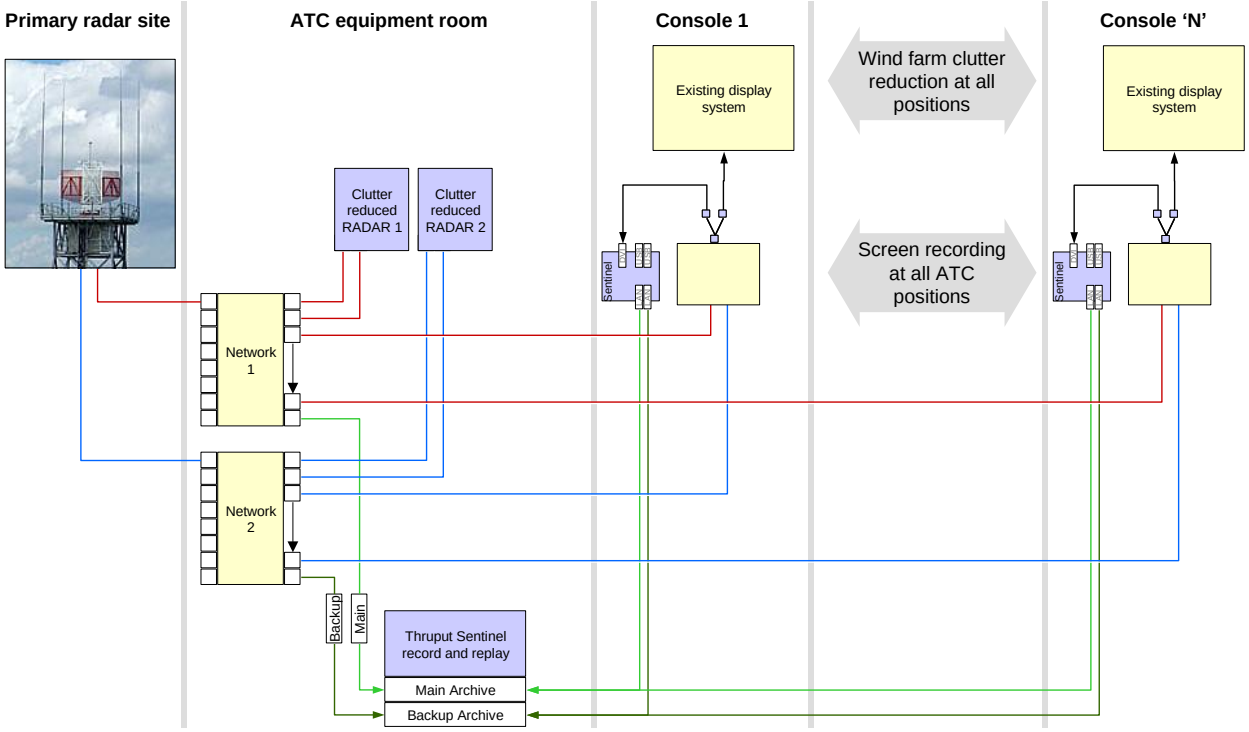


The high speed of FPGA logic enables an unlimited number of high precision clutter cells to be defined. In this example they are the range-azimuth cells affected by two clutter sources: An individual wind turbine and the traffic on a road bridge.

- Utilise existing operational data, to benefit from the pre-existing safety cases at the ATC unit.
- Avoid any data manipulation that could invalidate the existing safety cases.
- Calibrate the site, to identify areas of clutter, their shape and position.
- Provide visual presentation of radar data input and output for independent calibration and timing checks.
- Accept multiple radar feeds and support radar data mosaics.

To support the ATC units safety management system, the system is hardware based with the following design drivers:

ATC tower installation



Thruput Limited
14-15 Londonderry Farm
Keynsham Road, Willsbridge,
Bristol, BS30 6EL, UK
Author: ND
Date: Dec 2103

Office: +44 117 932 85 85
Fax: +44 117 932 93 39
Web: http://www.thruput.co.uk/
Email: sales@thruput.co.uk