Moving Target Detection and Multi-Channel Scan Conversion Presentation

Using SPx processing to create a pseudo-MTI channel that shows moving targets in a different colour to the background video

Summary

SPx supports moving target detection by combining a number of SPx objects into a processing chain.

Static video is identified by integrating the input radar data over time. Changing video is identified by subtracting the static video from the original video.

The SPx scan- converter can be used to construct a multi-layer radar display comprising the original data overlaid with the moving targets.

By selecting different colours and fade controls for the two scan conversions, the moving targets appear clearly discriminated against the background video.

A core capability of SPx is to scan convert radar video to a PPI display. Additionally, the SPx processing library and built-in capability to support multi-channel, multi-colour scan-conversion, permit more sophisticated displays to be presented with minimal programming effort.

This application note explains how to use SPx to identify moving targets in the input data. It then describes how to configure a second channel of scan conversion to display those moving targets in a different colour to be an overlay to the main video. The presentation of multi-colour information allows the operator's attention to be directed to those areas that may be more interesting, in this example the moving targets.

The basic sequence of operations for SPx scan conversion is shown below. The output window may be presented on an underlay window and overlaid with symbology in the normal way.
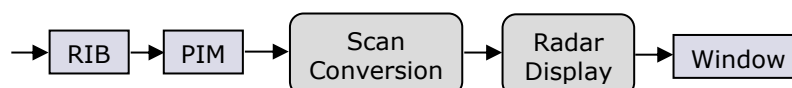

The first step in identifying moving targets is to detect video that remains constant from scan-to-scan. This can be achieved using an integrator, such that video persisting from scan-to-scan becomes progressively brighter in the integrated version. Video that is transitory has minimal effect on the integration store.

The SPx *Integrate* process provides the capability to integrate an input video from scan-to-scan. It maintains a data store that is updated from the input using the basic update equation:

$$I(+) = k.I(-) + (1-k).D$$

Where $I(-)$ is the integration store before an update, $I(+)$ is the store after the update and D is the data input. The gain control, k, is effectively a time-constant that adjusts the degree to which new data can affect the integrated store.
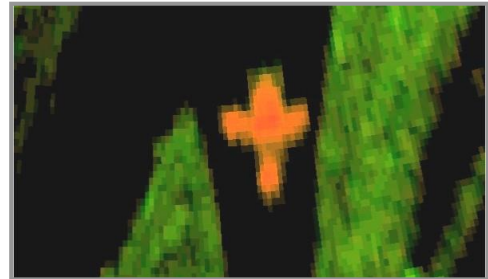

For a typical value of k as 0.9, for example, only 10% of the new data can affect the integration store, with the majority of the weight (90%) being given to the current value.

Where video is present at the same input sample from scan to scan (correlated), the 10% contribution on each scan will slowly build up (integrate) to a steady-state value that will eventually reach a peak level if the input data persists.

With the integration store maintaining the unchanging components of the scene, the areas of data that are changing may be computed as the difference between the input data and the integration store. The generic *Combine* SPx process may be used to subtract the integration store from the input data to give the Moving Target store.

This Moving Target store may then be processed with a separate scan conversion and display object, generating video that is displayed into the same window as the original data. By arranging the priorities of the radar windows, and setting the colour for the scan conversion, the display can be made to show the moving targets overlaying the original data in a separate colour.

The revised processing chain to accommodate the integration and subtraction looks as follows:

Radar layer
(background video)

Radar layer (MTI
video)
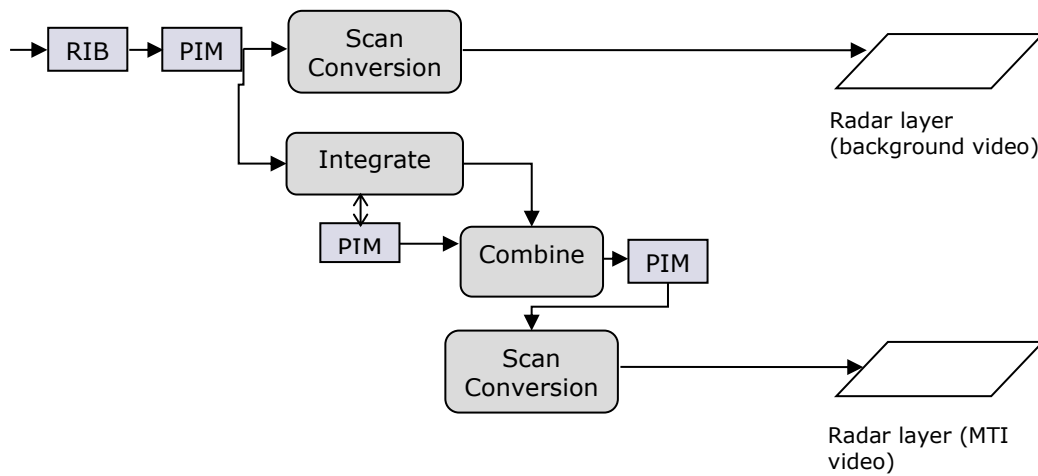
The *Integrate* process takes input from the main input PIM and derives an Integration PIM to hold the integrated data.

The *Combine* process is executed after *Integrate* and takes the Integration PIM as an input, which it subtracts from the main input PIM.

The resultant output PIM is used by the scan conversion which, for the examples shown opposite, show the scan conversion in red as an overlay to the green scan-conversion of the original video. Examination of the display immediately identifies the moving targets in red.

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