

MIDAS II... Video Integration for Helicopter Mission Systems

Requirement



Figure 1 MIDAS II is used on the mission systems simulator of the Merlin Helicopter.

In this project, several different computer and sensor systems, each manufactured by different Companies, generate the information used by the mission system. Each of the systems output an individual video, at its own native resolution, and all the video streams are updating asynchronously.

The role of the MIDAS 2 is to integrate all of the video sources into a single operators display, without changing any of them.

To accurately simulate the performance of the airborne system, the video integration must provide minimal throughput delay, pinpoint accuracy of the integration process, and most importantly, the operator's display must update smoothly in real-time.

Creating the composite video

These requirements dictate that all the video inputs should be subject to parallel processing, with independent video capture and synchronisation.

Once synchronised, each input may then be processed for cropping, positioning and control of transparency. This process is illustrated below, for a selection of four different resolution video inputs, for example:

- Aeronautical maps and coastlines.
- Weather radar returns.
- Surveillance radar returns.
- Target symbols and label information.

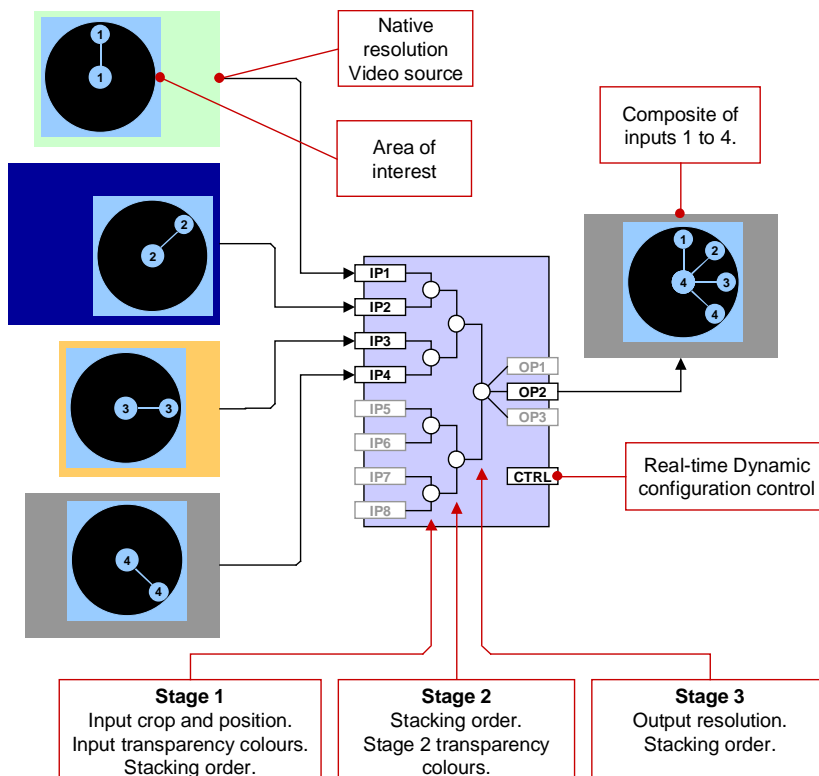


Figure 2 A composite of 4 video feeds, with areas of interest cropped from different resolution inputs and then overlaid transparently.

In this example, black is used as the transparency colour, so the important information from each layer in the stack is visible.

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Technology solution

The key technical requirements of this application are:

- 8 x DVI inputs.
- Independently synchronise all received data.
- Up to 3 DVI outputs.
- Cut, crop and position from each input.
- Set independent transparency colours on each input.
- Provide dynamic control over the composition, size and position of the output, with new settings implemented on command.
- Smooth flicker free video processing.
- Less than 64-millisecond throughput time.

To achieve the high throughput and response times, the solution completely avoids mathematical computations.

Rather, the solution is based on parallel arrays of field-programmable gate arrays (FPGA) and takes advantage of their inherent high speed logic processing to compare and control each pixel from every input.

At every stage, the system performs cross channel synchronization and ensures each internal process always has a complete video frame available from its preceding stages.

To facilitate dynamic control of the display, the system is initialised, via a set up mode, which is used to create and save a finite number of configurations. These are uniquely identified, so they can be loaded and implemented on command from the operator.

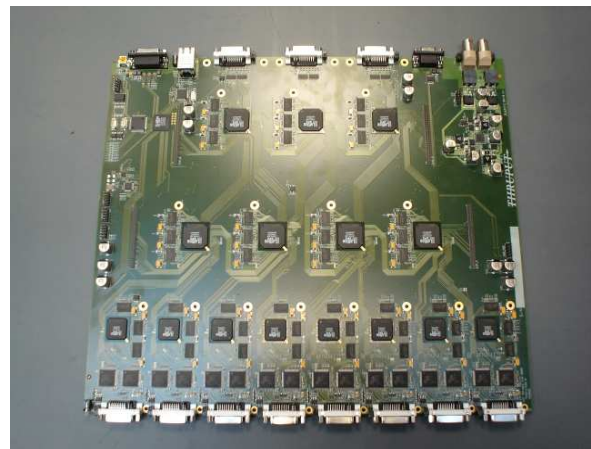


Figure 3 PCB of the MIDAS II showing inputs, processing stages and outputs. The control port and redundant power supply's are located top-right.

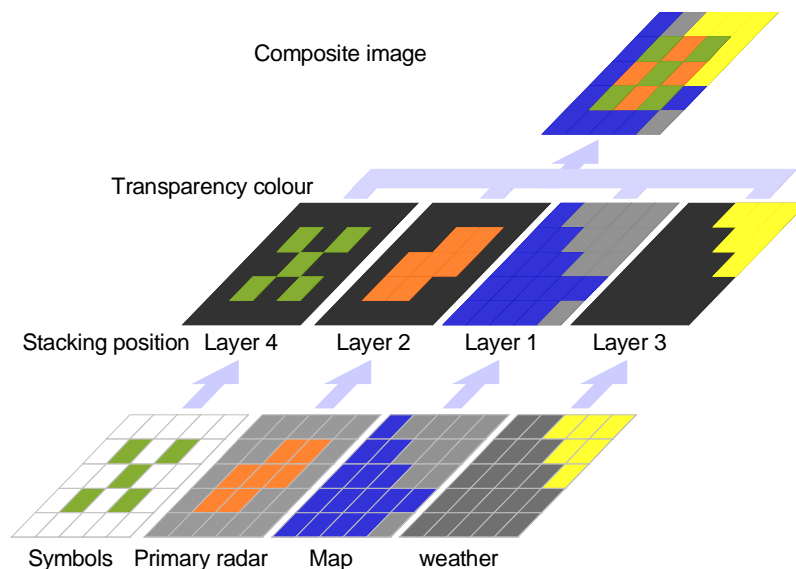


Figure 4 The process of pixel-by-pixel transparent overlay is illustrated for a small 5 x 5 pixel sample.

In this example, four videos are synchronized, cropped and positioned on capture (bottom).

Each video source has its position in the output display set (in this case symbols on top and map at the bottom) and its transparency colour set (middle). They are then added in layer order to create the output (top).