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NASA TECH BRIEF

Point-Source Detection System Rejects Spatially Extended Radiation Sources

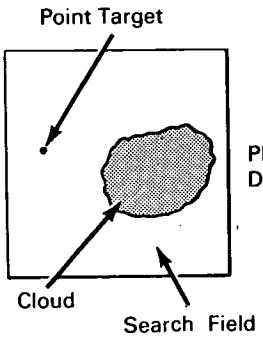

FIGURE 1

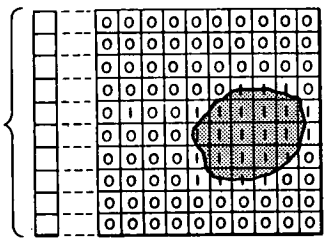

FIGURE 2

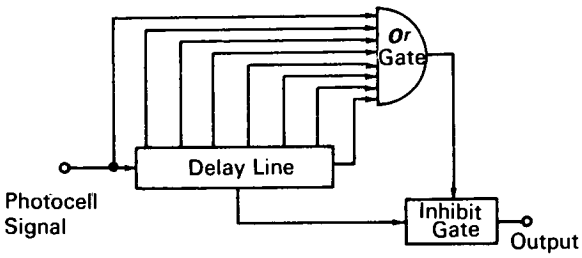

FIGURE 3

The problem:

To devise a reliable method for discriminating a distant (point source) target from false (spatially extended) targets in the field of view of an infrared detection system or tracking device. Various spatial discrimination methods (spatial filtration, pulse-length discrimination, area cancellation, and analog space correlation) that have been used to distinguish characteristic differences between the signals from a point target and those from larger-area targets require generally complex circuitry and are not entirely suitable for tracking a reentering space vehicle.

The solution:

A system employing digital space correlation to suppress false target signals in a point-target tracking device.

How it's done:

The search field (Figure 1), containing the point target to be tracked and a cloud representing an extended-area false target, is divided into a matrix of rows and columns of elemental fields of view. As shown in Figure 2, digital values are assigned to the matrix elements. That is, the elements containing no target radiation are designated by zeroes, and the elements in which target radiation appears are designated by ones. In accordance with the method described below, adjacent elements (such as those corresponding to the cloud) having targets are eliminated. Only the individual element corresponding to the point target is accepted.

Photocells mounted in a column are moved across the field matrix to scan the elements sequentially. When target radiation of sufficient intensity (above a threshold value) impinges on a photocell that is sampling a particular matrix element, the photocell will emit a signal pulse. If no radiation, or only a very low amount of radiation impinges on the photocell, the cell's output will be rejected. The pulses are fed to an *or* gate and to a delay line having seven

(continued overleaf)

outputs that are also applied to the *or* gate (Figure 3). The output from the *or* gate is applied to the inhibit input of an inhibit gate, and an eighth signal output from the delay line is coupled to the signal input of the inhibit gate. When there is a signal correspondence between one input to the *or* gate and the signal output from the delay line to the inhibit gate, no signal will pass through the inhibit gate. This correspondence occurs only for signals from photocells that sample an array of adjacent matrix elements intercepting an extended area target.

Note:

Inquiries concerning this system and modifications that will resolve certain ambiguous cases may be directed to:

Technology Utilization Officer
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Reference: B66-10622

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: R. F. Maxwell, Jr.
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