Overview of MT100 and TR100 Intrusion and Tracking System

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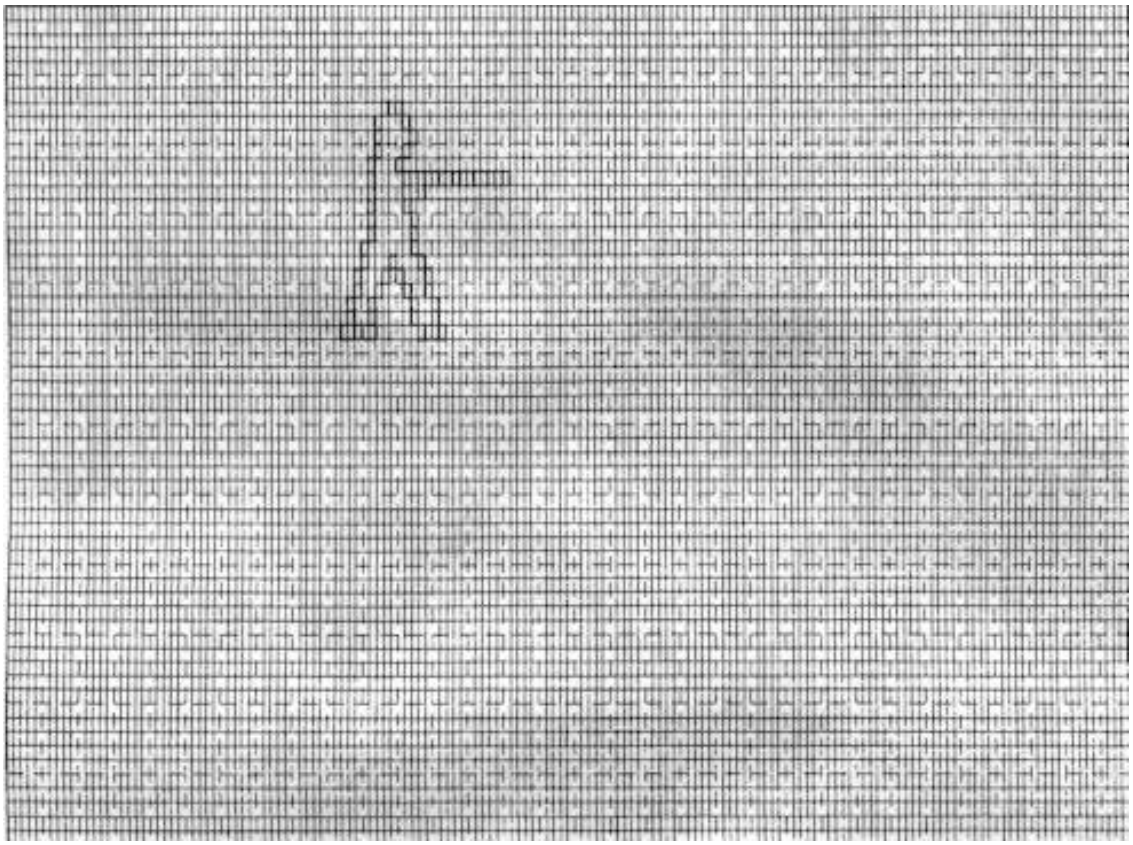
Summary of Video Tracking

Intrusion Motion

Tracking Data



OVERVIEW OF TRACKING CAPABILITY

The MT100 unit processes an image of 160 cells (x-direction) by 60 cells (y-direction) on a per-field basis. The cell area is the least significant zone for motion detection. There are 9,600 cells per field processed in real-time. Greater resolution is provided in the more significant horizontal motion direction since every other horizontal scan line occurs within a single field (odd or even). This is the reason the y-cell dimension is approximately twice the x-cell dimension. The above figure illustrates the cell motion plotted on a x-y axis basis. Each cell status is defined by a true/false indication (1 bit) of motion. The dynamic motion status of the entire image is defined by 1,200 bytes of tracking data at an update rate of 60 times-per-second. The decoder chip of the TR100 unit decodes these serially transmitted tracking data and organizes them into RAM memory in a x-y configuration. Software post-processing within an external computer could readily develop motion vectors and profile identification from this low volume of very significant data. The motion vectors and x-y location of an intruder provide the basis for pan/tilt control of a tracking camera. One MT100 unit processes up to eight cameras concurrently. The pan/tilt

control could manage up to eight cameras concurrently. This circuit sharing provides economy; the MT100 unit is a low cost device.

PROCESSING BASICS

The MT100 unit performs image processing to locate object edges around all four sides of each cell with a patented algorithm. This algorithm assures edge detection, even with fuzzy image edges, while filtering video noise. Front-end processing provides enormous data reduction. By comparing each current cell status with a stored reference cell status at the same location, motion can be detected. A user-generated mask of the scene is used to inhibit motion detection in the areas masked on a per-cell basis. A count of the number of cells in motion can be used for a basis of alarm status of the current scene. If the count exceeds a user-selected tolerance, the alarm status will be true. Contrast sensitivity (threshold) is also user-selectable. An Automatic Lighting Compensation (ALC) performs the function of a digital Automatic Gain Control (AGC) on the digitized image to maintain a near-constant scene lighting intensity over approximately a 40 db lighting variation. The processing applies to up to eight cameras; these cameras are sequentially processed. Each of the parameters of threshold, tolerance, masking, and ALC are controlled individually for each of the multi-camera inputs. The primary output is a serial (digital) transmission containing alarm status, self-test status, tracking data, data recovery synchronization timing, and other control status/timing. These data are transmitted for each channel (all of the data all of the time).

SYSTEM CONTROL/DISPLAY

The MT100 unit has an RS-232 communication link to a controlling computer. The link provides all controls from a connected computer to the MT100 unit. It also provides operating status from the MT100 unit to the computer. The computer priority software permits operator entry of all of the parameters defined. A video image may be routed back to a frame grabber card within the computer to digitize the video scene (for each of the cameras). The operator can overlay masking over this digitized image with the resolution of the cell structure. The mask can then be transmitted to the MT100 unit for RAM storage and for MT100 unit usage. The computer can use disk-stored masks for this purpose. The computer also receives and displays the current alarm and self-test status for each camera.

MT100 UNIT OUTPUT MONITORING

The digital output of the MT100 unit is intended to provide information to a receiving computer. It is not intended that personnel would view this output. There is a second output that is a video signal with sequenced fields of video data from the multiple cameras. These two outputs could be recorded when an alarm-status is present (a small expected duty cycle). The TR100 unit was developed to provide play-back-capability of these two outputs. The TR100 unit decodes the digital output to re-establish all of the transmitted parameters with proper timing synchronization. Tracking-data and digitized-video of a selected channel are stored into RAM. This is done while maintaining the x-y format at a rate dependant upon the multiplexed mode (single, four, or eight channel). The selected channel of video data is recovered from RAM, converted to an analog-video signal, and output to a video monitor. The same current image odd and even fields are output each field interval until the new field update at the sequenced interval. The video channel selection of the unit can be set to automatically follow an intrusion from camera to camera. The decoder Field Programmable Gate Array (FPGA) within the TR100 unit also controls RAM storage organization. This design could be used for a computer embedded circuit card that would transfer the tracking data and status indicators to the computer RAM. Multiple MT100 units could be accommodated by one circuit card. Post-processing within this computer could produce pan and tilt controls to camera platforms.