

SPECTROHELIOGRAPHS BY COMPUTER IMAGING

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What is involved is a modification of the recording module of the spectroheliograph from photographic to digital. Video capture and video display of solar activity provides instant and continuous monitoring of activity. Furthermore, images promise to be sharper, and the digitized images immediately can be processed and analyzed while being displayed, stored to disk or tape, output to video hardcopy, and many others.

Simple systems suffice for a sunspot or flare monitor. For a sunspot monitor all that is needed is a refractor, a neutral filter and a videocamera at the eyepiece. On the other hand, to monitor solar flares and other activities, the neutral filter is replaced by a hydrogen H-alpha filter. But the opto-electronics for a spectroheliograph is more complex.

In the original spectroheliograph, a system of diffraction grating and slits is needed to make an observation in a particular wavelength. Thus only the image of a strip of the sun is obtained at a given moment. To get a picture of the whole sun the film is made to scan the exit slit with the same speed that the image scans the entrance slit. Events off the solar limb, like prominences and surges, also can be recorded. By changing the position of the diffraction grating (15,000 lines/inch), the sun can be observed in other wavelengths. Most observations are in hydrogen H-alpha (6563 A) and ionized calcium K (3933 A) lines. The end photograph contains a seven centimeter image of the sun.

Discussions led to Tectronix providing a computer imaging system for evaluation. The basic parts are a CCD-based video camera with high precision lens, and a frame store board which requires only an IBM XT computer and the software to control the action of the store board. The camera takes 30 pictures/sec of the entire slit. Scan rate of camera has a limit of 1000-1500 as the number of changing images of the slit in 2 minutes, but the video display can only show 500 of them.

The frame store board is equivalent to a Colorado Video 491 with two 512 x 512 8-bit memories which holds two full