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Remote sensing satellites equipped with cameras that make use of curved focal plane detection devices, including curved CCD's and CMOS devices, have distinct advantages over their flat detector counterparts in both geosynchronous and non-geosynchronous tracking modes. Any camera or telescope designed with curved focal plane detectors benefits universally over flat detectors by optimizing its optical system to converge an image over a preferred Petzval curvature surface established by the camera or telescope. The result of this optimization process yields a wider aperture for greater sensitivity, 75% fewer optical components due the elimination of field flattening optics, lower mass of the complete imaging system due to miniaturization and size reduction of the optical system, and greater resolution, depth of focus, and field of view of the image area through the expansion of the imaging field. In light of these fundamental improvements, additional features are enabled for orbiting satellites. In the case of the non-geosynchronous tracking satellite, curved focal plane detection optics provide real time, multi-perspective scanning abilities from a single camera device, utilizing the high speed curved imager, which in turn captures and processes 3 dimensional data taken from a rapidly shifting surface environment at the speed of light and at higher resolution, rather than in computerized post processing with conventional orbiting imaging satellites. This attribute of the high resolution curved focal plane imager renders it unique among all other imagers due to the simplification of its primary optical structure, creating a lens system that is omnivergent as well as completely solid state, with no moving parts, to achieve the multi-perspective and multi-spectral acquisition of images with a single moving camera in remote sensing mode. In such a case, the pivoting of the camera's optical axis, performed at high speed and in synchronicity with the image capturing frame rate of the curved focal plane high speed imager, runs in solid state mode with no mechanical parts as it scans over its target, sending a sequence of very high resolution, multi-perspective images directly to the receiver in real-time without the need for 3 dimensional image reconstruction. Consequently, such a remote sensing moving camera will possess a wider field of view than a flat detector camera due to its optimized curved focal plane optics, thereby transmitting additional three dimensional data sets over a larger area to the receiver in the same sequence of the scanned imaging region. This eliminates the need for additional orbiting passes of the respective region to be imaged by the satellite, making the satellite more efficient in the recording of 3D images, as well as expanding its 3 dimensional data set far beyond what an equally orbiting flat detector satellite camera could accomplish in the same time space. Furthermore, its time base for imaging in 3D will be denser in multi-dimensional detail due to the curved focal plane benefits just described, and can be enhanced to an even greater extent by coupling additional curved focal plane cameras along an axis aboard the satellite. In the case of the geosynchronous satellite utilizing a curved focal plane detector camera, the same benefits would apply as described previously, enabling these satellites to harness omnivergent imaging from a single fixed location in space, acquiring wider 3 dimensional fields of view for different imaged altitudes at higher resolutions and greater sensitivity, all in real-time, even as the satellite pivots its angle of view during a scanned sequence. Such satellites would also be able to perform real-time twin mode stereoscopic tracking over much wider fields of view and at higher resolutions for greater detailed 3D analysis of rapidly changing atmospheric phenomena or shifting land environmental activity over shorter time sequences.

--David Mark