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The role of position sensing in adaptive optics

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Adaptive Optics systems measure and correct dynamic optical distortions, often atmospheric turbulence, to improve overall system performance. Such systems have grown from their astronomical inception in 1953 to cover many fields including ophthalmology, high power lasers, communication, optical storage and astronomy.

There are many different systems but common to all is the need to measure optical distortions. often at high spatial resolutions and kilohertz rates. Various forms of optics such as the Shack-Hartmann sensor are used to develop optical turbulence into patterns of moving light that may be sensed and processed to drive the corrective mirrors.

Initially vidicon CRT technology was used, being replaced by many forms of position sensing detectors including QPDs, APDs, fibre coupled PMT arrays and MCP devices. Modern astronomical systems are converging on the use of CCD sensors often with on-chip electron multiplying gain, driven by the need for high framerate and spatial resolution at extremely low light levels, while CMOS sensors hold promise for higher light level applications. In this talk an overview of sensors in modern adaptive optics, looking at the benefits of moving to image sensors , and what further development may occur.

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