Shooting Stars

Computers have two main uses in the field of astronomy: maintaining a database of observed objects, and calculating their current position to aid accurate telescope alignment

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Guiding Light
Optical astronomy is made considerably easier when an accurate prediction can be made of the location of a given star or planet on a given day. A home computer can easily contain the database of star locations, and can quickly perform the necessary calculations. With the addition of stepping servo-motors it can even position the telescope

When you look up at the night sky and locate the nearest star, you are actually seeing that star as it was four years ago, because that is how long it takes for the light to reach us from Proxima Centauri. In those same four years the microcomputer has advanced from a rare and expensive novelty to a common peripheral in the British household. Astronomy is an application that utilises to the full a home computer's potential for data handling, computing and robotics.

There are three main types of problem that an astronomer faces when studying the night sky: the initial observation of the celestial object, the handling of data obtained through observation, and the meaningful analysis of this data. In each of these areas the computer is a useful aid.

Let's begin by looking at how a home computer can help in making the calculations needed to construct the astronomer's basic tool — the telescope. The actual arrangement and design of the lenses and mirrors in a telescope is critical to the quality of the final image, and can be mathematically calculated to give the best results. Amateur astronomers often like to build their own optical systems, but before home computers became widely available, it was often quicker and easier to put together an experimental design than to perform the painstaking calculations needed for light ray diagrams. With a computer, the calculations that might have taken a week can now be completed in a few minutes.

Locating a star in the sky is another problem that a computer can help us to solve. Stars are not fixed objects — they trace trajectories across the sky in the course of the night (an effect caused by the earth's rotation), and their positions in the sky are subject to seasonal variations. The method of locating a star is similar to the system of latitude and longitude used in terrestrial geography. If we imagine a co-ordinate system projected across the inner surface of the night sky, each celestial object can be located by two co-ordinates called the 'declination' and the 'right ascension'.

Every object can then be marked down on a star map according to its co-ordinates, and the individual maps combined into an atlas of the skies. Such atlases are very important for observing planets and other objects that move against the backdrop of fixed stars, or for discovering completely new objects like comets. These star atlases are now being put into databases for home computers. These database programs also include information about the brightness or luminosity of individual celestial bodies, the spectral quality of the light they omit (obtained when the light is passed through a prism or analysed by a spectrometer), and the type and age of the star. All of this information can be displayed on the computer's television set or monitor, in the form of maps showing the sky from any latitude at any desired time.

Because of the earth's rotation, stars will drift out of view in a few minutes, even on a telescope with a large field of view. Using one that can focus