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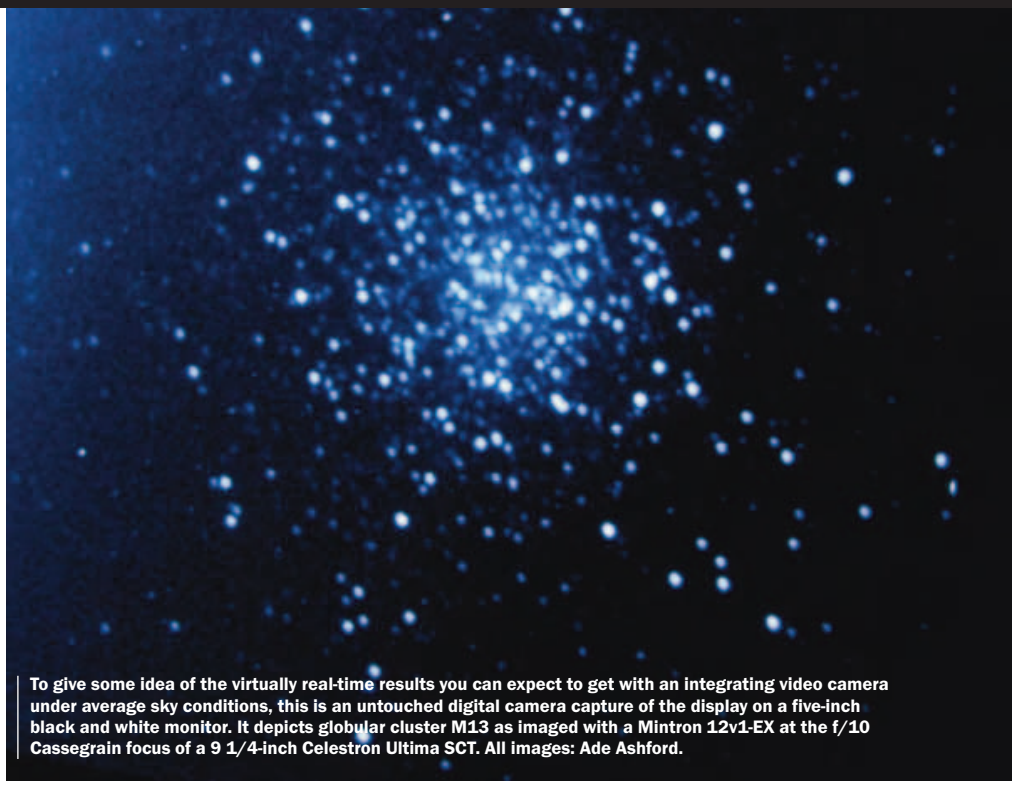
Video astronomy

an introduction to integrating video cameras

Ade Ashford investigates some easy-to-use video cameras that will help you reclaim starry skies.



To give some idea of the virtually real-time results you can expect to get with an integrating video camera under average sky conditions, this is an untouched digital camera capture of the display on a five-inch black and white monitor. It depicts globular cluster M13 as imaged with a Mintron 12v1-EX at the f/10 Cassegrain focus of a 9 1/4-inch Celestron Ultima SCT. All images: Ade Ashford.

"It was the best of times, it was the worst of times." That often-quoted line from Dickens' *A Tale of Two Cities* neatly paraphrases the plight of the modern amateur astronomer. Observers' have never had such an embarrassment of riches in terms of the diverse range of telescopes and accessories available, particularly the reasonably priced equipment of good optical quality currently manufactured in the Far East. At home, too, the British telescope making industry is seeing something of a welcome renaissance.

The flip side of the coin is that while most of us can acquire the tools to study the heavens, the majority of astronomers living in urban areas have to contend with such severe light pollution that it threatens to deprive us of all but the night sky's brightest treasures. But the fight to reclaim the stars goes on, and a quiet revolution is taking place in back-gardens up and down the land. Previously keen visual observers are abandoning their eyepieces in favour of an all-electronic view of the cosmos, using a technological offshoot of CCD imaging.

Just as the CCD, or Charge Coupled Device, has effectively supplanted traditional 35mm film in astrophotography, a growing band of observers have embraced a device known as an integrating video camera (IVC). While these cameras are not new — instruments from respected manufacturers Mintron and Watec have been around for some four years — contemporary models have a number of enhancements in terms of increased sensitivity and remote control that make them more appealing to back garden enthusiasts.

The appeal of an IVC lies in its ease of use, the instant gratification and the 'wow factor' one experiences from the immediate results it delivers. Unlike a CCD camera or a modified webcam for lunar and planetary imaging, both of which require time and a certain skill with computers and image processing software to produce meaningful results, the IVC can be used without a computer and requires no more technical skill than that required to operate a video recorder.

I will illustrate the remainder of this article with specific reference to the monochrome Mintron 12v1-EX, but the principles are common to the latest Mintron 12V6HC-EX (which has remote control capabilities) and its principal competitor, the Watec-120N. The Mintron camera body measures just 95 x 50 x 50mm and weighs some 340g. For use in a telescope the camera is usually sold with a C-mount to 1.25-inch nosepiece to fit standard focusers. A 12V DC 180mA supply is required to power the Mintron. A BNC socket on the back of the camera accepts a coaxial cable for use with a simple black and white portable TV, or a phono plug adaptor enables it to be used with a camcorder or VCR to record what you see.

How does an IVC work?

The Mintron 12v1-EX, in common with many competing models, has at its heart a very sensitive Sony ICX248AL EXview HAD CCD sensor. Measuring some 8mm x 6.5mm, each of its 380,000 effective pixels are just under 0.01mm in size. The Mintron camera captures images every fiftieth of a second (PAL format) and is capable of automatically stacking (combining) up to 128 exposures, delivering a continuous display to an attached monitor. Under the maximum-sensitivity setting, these cameras approach ratings of 0.00005 lux. (Lux is a measure of a camera's sensitivity to dim light; the smaller its value, the more sensitive the camera is.)

Enough of the theory, what makes it such fun to use? This is best illustrated by an example. On the evening of Tuesday 23 October 2007 I was observing from my heavily light polluted back garden near the centre of Weston-super-Mare. The skies were generally clear, but the sky carried an orange cast from sodium streetlights reflected off a thin veil of high cloud. A waxing gibbous 12-day-old Moon lay amid the stars of western Pisces. The glare of its 92 percent illuminated disc was such that of the naked eye stars within a 40-degree radius, only those four marking the Square of Pegasus could be made out.

Under these challenging sky

One of the most popular and easy-to-use IVCs, the Mintron 12v1-EX, used at the Newtonian focus of a small reflector. Note the silver BNC connector, coaxial video cable and the 12V power supply cable. While Schmidt– and Maksutov–Cassegrains will have no problems focusing, some Newtonians may need to be slightly modified to use such devices if there is insufficient in-travel of the focuser.

conditions I placed my trusty AstroScan, a 105mm f/4.2 Newtonian on an undriven alt-azimuth mount, and chose some visual deep-sky favourites in the three-degree field of a 28mm eyepiece. Globular cluster M15 in Pegasus lay some 36 degrees from the Moon to the south-west and was merely a condensed smudge in the 'scope. M31, the great Andromeda Galaxy, was just a few degrees farther (43 degrees) from the Moon over to the east, but despite its higher altitude looked utterly washed-out with just the nucleus visible in the AstroScan at 16x.

So much for the visual appearance. I replaced the 28mm eyepiece with the Mintron 12V1-EX. Fortunately, the focuser had sufficient in travel to permit the camera to reach focus (this is where Schmidt- and Maksutov-Cassegrain observers are at an advantage since the focal point is readily accessible), so this is a very important consideration if you wish to start video astronomy. If you own a Newtonian telescope it may mean that you will have to move the primary mirror forward.

The 12V1-EX has a series of push button controls on the back to set custom features like automatic gain if you are looking at something bright. This way I was able to image the Moon, beautifully framed in a one-degree field, on an adjacent monochrome monitor. Moving back to M15, I increased the sensitivity to maximum and was staggered to see the not only innumerable background stars but the resolved peripheral stars of this wonderful globular cluster. The principal dust lanes in the spiral arms of M31 were also detectable. Compared to the naked-eye view, an IVC such as this will increase your faint star limit by some three magnitudes — all in virtually real-time!

The 445mm focal length of my AstroScan lies at the upper focal length limit you can use with an IVC without having a telescope drive. With Mars favourably placed this month, the planet's diminutive moons Phobos and Deimos would be detectable with a driven eight-inch telescope. If you have a GOTO instrument, why not trail the cables indoors and observe in the warmth and comfort! At the other end of the focal length spectrum, why not attach a C-mount camera lens and enjoy wide-field imaging of meteors and aurorae? With an integrating video camera you are limited only by your imagination, and it's a great way to reclaim the stars.

Even small telescopes can produce remarkable results with an IVC. This undriven, 105mm aperture AstroScan Newtonian readily resolved the outlying stars of globular cluster M13 from a heavily light-polluted urban location with a nearly full Moon just 40 degrees away!

At a glance

Mintron 12vI-EX

Supplier:	**Modern Astronomy**
Price:	**from £269**
Website:	**www.modernastronomy.com**
Phone:	**020 8763 9953**

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More to explore

- **www.fortunecity.com/victorian/canterbury/222/astrovid.htm – the home of the Video Astrophotography E-mail Discussion Group and Resource**
- **www.qcuiag.org.uk – the QuickCam and Unconventional Imaging Astronomy Group, who explore the use of 'unconventional' electronic imaging devices.**

An integrating video camera (IVC) nicely complements a standard eight-inch Schmidt–Cassegrain telescope for imaging the Moon and planets. Here a Mintron 12v1-EX is used at the Cassegrain focus of a Celestron Celestar 8. With such a setup its possible to capture the moons of Mars near opposition, but a Barlow lens may be required to enlarge the image scale sufficiently.