Webcam Planetary Viewing (part 1)

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Required equipment:

1: Telescope
2: Webcam
3: Barlow
4: Laptop Computer
5: Remote power for laptop and telescope

Webcams can be an inexpensive way to display Jupiter and other major planets on a Laptop computer screen in real time. This will allow others to gather around and also enjoy the view.

Most telescopes will display an image of Jupiter, and of course, the larger the image is the better. If a Newtonian or Schmidt type telescope is used, the finer the collimation the better the image. Most planetary visuals are very much at the mercy of the upper atmosphere so some evenings will present sharper images than others. Even in poor conditions there are usually some windows of steadiness resulting in moments of pleasing views.

Most Webcams come with their own version of drivers and operating software. They are almost all powered through the laptop computer's USB port (preferably a USB2). Each camera has controlling software that allows adjustments to the contrast, brightness and gain setting in order for you to display a pleasing image on the Laptop's screen.

There are also planetary cameras available from some of the major telescope distributors. These cameras are mostly CMOS types, whereas the majority of actual Webcams are CCD. Both are similarly priced, although there are high-end CCD planetary cameras that can cost as much as $800. Good results can be obtained from a camera priced between $100 and $300, with the most popular being the Phillips ToUcam, which has a removable lens allowing a 1.25-inch adaptor to be

attached in place of the lens. The camera will now insert easily into any telescope eyepiece holder. This camera comes with the 1.25 adaptor and all software to operate the camera.

A Barlow lens can be placed between the camera and the telescope in order to enlarge the image for more detail. Jupiter's moons can be viewed when the gain and other factors have been adjusted. With a narrow field of view, the moons would have to be close to the planet in order to see them in the frame. Also, focal reducers can be used in place of the Barlow to increase the field of view. If the FOV is large enough and the adjustments correctly set, all the moons may be visible with a wide field telescope.

It is much better if the laptop has a USB2 port for rapid frame update. Also a 12-volt battery should be employed to keep the laptop's battery charged. If the laptop will not take 12 volts directly, an inverter can be used between the battery and laptop. In this case the laptop's 110vac power cord would be plugged into the inverter. The battery could be a car battery with the inverter plugged into the vehicle's cigarette lighter/accessory plug.

Basically that's it. Place the Webcam/Barlow in the telescope's eyepiece holder, fire up the laptop, start the Webcam's software system, and in real time focus the image. Once the image is focused as best it can, gather the others around and enjoy the view.

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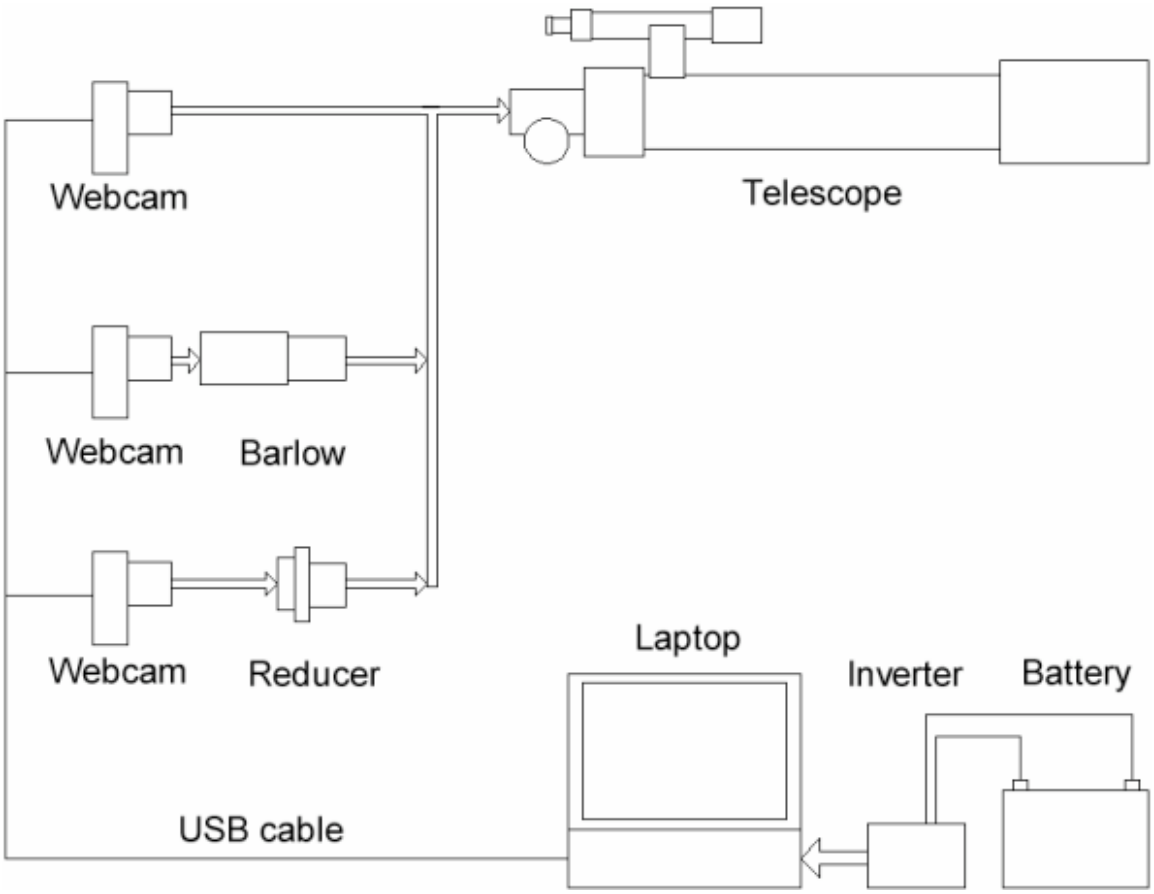

Possible configurations for video display

Webcam Planetary Viewing (part 2)

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Below is a list of the general type of equipment needed for "computer-video astronomy", as well as examples of specific units where applicable:

Power-source(s). Depending upon location, and related access to AC power, it may be possible that DC power-sources (deep-cycle batteries) will be needed. Generally speaking, a laptop's battery will not be sufficient on its own, for powering both the computer and the camera (powered via USB from the laptop) over the course of a multi-hour period. If the laptop, mount, and camera have 12V power-adapters available, those are all that will be needed in addition to the battery-source. Otherwise, it will be necessary to use 12V-120V adapters to allow the system components to be used with their AC power-adapters.

Computer. While any computer capable of communicating with the camera and running related software is able to be used, a laptop has obvious advantages. Computers used for this application should have USB2.0 connectivity to ensure compatibility with any of the cameras that might be used. 1-2GB of RAM and 2+ GB of free hard-drive space are recommended. The speed of the processor is less important, but 1+ GHz is suggested.

Mount. A tracking mount of some type will be needed, but several varieties will work just fine:

Manual German Equatorial Mounts: GO-TO is not needed, as long as the operator has a knowledge of the sky. However, a tracking motor or clock-drive will be required. Generally speaking, pre-owned mounts are what will make up this class, but they are available new. Vixen, Losmandy, Skywatcher, and Celestron all offer non-computerized German Equatorial Mounts of various prices.

Computerized German Equatorial Mounts: A few of the more

entry-level motorized GEM (German Equatorial Mounts) are actually computerized. Most notably, the Meade LXD75 and Celestron CG-5GT (Advanced-Series Mount) are available at less than $600. Both of these mounts posses the needed pointing and tracking accuracy required for video astronomy, and have the benefit of being able to accept a large variety of optical tubes, up to the weight of about 25 pounds.

Computerized Alt-Az mounts: Over the last ten years, there has been an increasing number of packaged telescopes that use robotic Alt-Az mounts. Celestron offers (or has offered) the Nexstar GPS, Nexstar SE, Nexstar SLT, and the CPC series telescopes. The Celestron Nexstar SE series would be an excellent choice for an astronomer wanting to do this type of outreach, from a cost/portability/performance perspective (starting at about $500 for both telescope and mount packages). Meade similarly offers the ETX, LX90, and LX200 series. The ETX telescopes would be most appropriate from a cost perspective (the 90MM is less than $600, including optics). Vixen offers their SkyPod, a very nifty little computerized Alt-Az mount that works with various telescopes through its inclusion of a dovetail/saddle mounting system (previously mentioned Alt-Az mounts are only meant to be used with their bundled telescopes). The Skypod sells for $1199 with tripod. Similar to the Vixen SkyPod are the mounts from iOptron. Of their offerings, the iOptron Mini-Tower and Cube-Pro are most appropriate to video-astronomy. The Mini-Tower retails for $799, and the Cube-Pro for $480.

Telescope. Any kind of telescope can be used for this application. However, an effective focal-length of 3000-6000 millimeters is strongly suggested. Without sufficiently long focal length, the planet will not appear very large on-screen. The term “effective focal length” is worth further definition. A telescope need not have 3-6 meter focal length, as barlow-lenses or other tele-negative optics can be used. However, one should not use more than one such optic, and the most powerful barlows are in the 5X range. So if a 5X barlow is to be used, the telescope should have a native focal-length of at least 600MM.

Out of the different optical designs available, Schmidt-Cassegrain and Maksutov-Cassegrain are likely to be the most convenient. Their compound optical designs lead them to be far more portable than other designs with similar focal length.

Camera. Interestingly, in comparison to cameras for deep-sky photography, the main requirement for a planetary imaging camera is the ability to take SHORT exposures. Many of the introductory-level deep-sky cameras can be used, and there are also cameras dedicated to this purpose. Make sure that the camera is capable of 1/100th-second or faster exposures. Some great choices would be (all three include the software needed for image capture and display):
Celestron Neximage $99
Imaging Source 1CU (DFK21AU04) $350
Orion Starshoot III Solar-System Imager $189