Introduction to Digiscoping: Video Image Capture

Robert C. Turner

Digiscoping is a term that describes the photographic technique of using a digital camera attached to a spotting scope (fieldscope) for capturing images. Since the invention of the digiscope in 1999 by Lawrence Poh, the technique has become widely accepted among birders, photo naturalists and natural science researchers. The evolution of digiscoping has enabled practitioners to use a variety of still cameras from simple compact digital cameras (point-and-shoot) on up through advanced single lens reflex cameras (DSLRs). The development of video digiscoping, however, has not had widespread acceptance until the recent addition of high definition (HD) video, which is now readily available in most digital cameras. This article briefly reviews a vintage proprietary standard video system that was first introduced to digiscoping, and then compares and contrasts that with current HD video technology. Tripod and head selection is also discussed, and test video clips are included that demonstrate both technologies.

Perseverance! (continued, patient effort)
Edith Marie Weller

Introduction

Whether one uses a digiscope to capture still or video images, the technique utilizes a fieldscope (spotting scope) to which additional optical accessories are attached. I work with a Nikon ED82-A Fieldscope (Figure 1), which comes equipped with a Nikon MCII 25-75x zoom removable (threaded) eyepiece. The scope is, in and of itself, an outstanding optical device for viewing wildlife at a distance. It has provided me with fantastic views of natural science subjects that might otherwise have gone unnoticed, and it's the base from which I operate all digiscoping efforts. The lenses' extra-low dispersion (ED) optics help correct chromatic aberrations, or optical color defects, caused when light of different wavelengths do not converge at the same point as they pass through optical glass. Older conventional telephoto lenses were susceptible to cracking and sensitive to temperature changes, but the introduction of ED optics has corrected those deficiencies. Once the eyepiece is removed, the scope's capabilities are expanded by attaching either a dedicated video capture unit or a digital single lens reflex (DSLR) adapter (i.e. Nikon FSA-L1), which in turn allows the attaching of any number of Nikon DSLR camera backs.

Figure 1. *A) Nikon Fieldscope ED82-A, 1000mm focal length lens. B) 45° angled zoom MCII 25-75x removable (threaded) eyepiece. C) Manfrotto 501PLONG Rapid Connect Plate, mounted on Manfrotto 501HDV head, and Bogen/Manfrotto 3221W aluminum tripod.*

Digiscoping with a Proprietary CCD Video Imaging System

At the turn of this century Nikon introduced an exclusive video capture system, but it could only be coupled with their best fieldscopes. The Nikon Field Image System MX (MX) was the first dedicated video capture system designed for digiscopers to view, and have access to a recording signal, but did not include a recording device. The system facilitates viewing subjects at relatively long distances, and also allows a group of viewers to simultaneously make observations. That feature is especially useful for school teachers taking classes of children on natural science outings. In order to provide an objective opinion on the MX system I am including a comprehensive overview (minus any commercial references to pricing) of the system's specifications that was published by *Rifle* magazine in one of their Products

Reviews: (Reprinted with permission Sept/Oct 2000 issue of *Rifle* magazine www.riflemagazine.com):

"Nikon has introduced a revolutionary viewing accessory for its flagship Fieldscope series of spotting scopes that is sure to be popular with a wide range of users including birders, shooters, hunters and law enforcement agencies. Nikon's Field Image System MX is an 80x CCD camera system (equivalent to a 4000mm lens) that attaches to a Nikon Fieldscope in place of an eyepiece. The Field Image System MX is linked to a four-inch LCD color monitor. The result is a high resolution imaging device that allows group viewing or remote observation and can be linked to a camcorder to produce a video recording of whatever is seen by the viewer.

The Field Image System MX camera weighs just three ounces and is powered by four AA batteries that provide 15 hours of operation or by the included 6V AC adapter. The entire unit measures 4.5x2.7x1.6 inches and screws into the Fieldscope like an eyepiece.

Complementing the Nikon Field Image System MX is the high resolution LCD color display that incorporates 270,000 pixels and 330 TV line resolution. The display is powered by eight AA batteries that provide six hours of operation, or by the included 12V AC adapter. Measuring just 5.1x4.1x2.4 inches and weighing only 12.3 ounces, the display is compact and lightweight for easy carry and employment.

The unit close focuses to just 5m (16.5 feet), so it can be used to view distant objects or make highly detailed studies of closer ones. At 100 yards the field of view, as displayed on the monitor, is 2.7x1.8 feet. By simply attaching a cord to the appropriate jack on the monitor, the user can do videotaping.

For situations where less than 80x magnification is desired, Nikon has included an F-mount camera lens adapter that allows use of the system with any of Nikon's broad selection of Nikkor 35mm camera lenses instead of a Fieldscope body.

The Field Image System MX is also supplied with an accessory lens with a close focus distance of just 1.2 inches. This lens has a focal length of 12.9mm, and the field of view is 84x63 feet at 100 yards. At the close focus distance of 1.2 inches, the field of view is .24x.32 inches, ideal for close examination of [small objects]. Each Nikon Field Image System MX comes in a green Nikon hard case and is supplied with a 6V AC adapter, a 12V AC adapter, a clip-type tripod adapter, a sun shade for the LCD monitor and two accessory cords. Like all Nikon binoculars and fieldscopes, the Field Image System MX carries Nikon's 25-year limited warranty."

The Nikon Field Image System MX (Figure 2), as described in *Rifle*, comes in its own carrying case with a shoulder strap, which is very convenient for taking on digiscoping shoots. Setting-up the system requires care as the course threads of both the fieldscope's eyepiece, and the CCD camera, must be handled carefully to prevent cross-threading. Once the scope's eyepiece has been removed, the CCD camera is attached. The monitor is then connected to the clamp provided, and affixed to one of the

Figure 2. *Nikon Field Image System MX: A) LCD monitor. B) RCA wire connecters. C) AC power adapter for monitor. D) Clamp to attach monitor to tripod leg. E) 80x CCD camera. F) AC adapter for camera. G) 12.9mm close-up lens. H) F-mount camera lens adapter.*

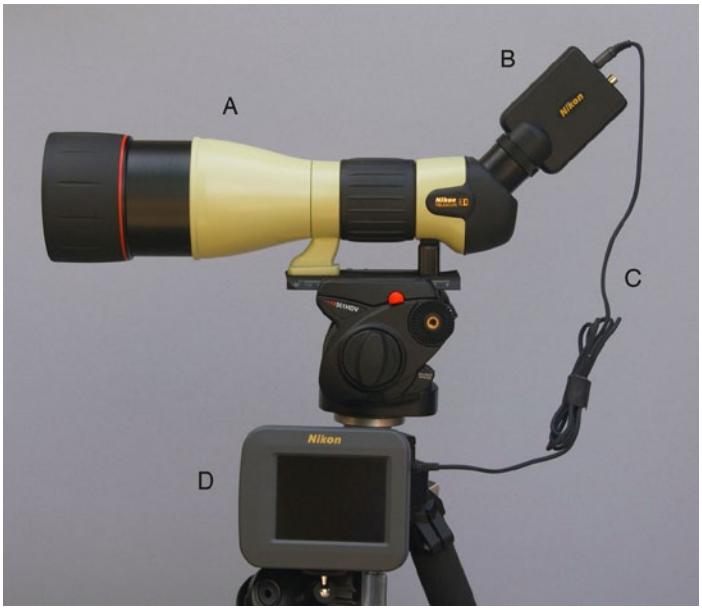

Figure 3. *A) Nikon Fieldscope ED82-A with 82mm objective. B) Nikon 80x CCD camera. C) Mini to mini cable connection (camera to monitor). D) LCD monitor clamp-mounted to tripod leg.*

tripod's legs. Next, the 6' mini/mini (3.5mm) connector cable is attached between the CCD camera and the monitor (not with an RCA cable as described in *Rifle's* review). At this point in the set-up the system is ready to be turned on and used to view subjects via the monitor (Figure 3).

The configuration takes getting used to, as you do not look directly through an eyepiece, but aim the lens toward a subject and focus the fieldscope while viewing the subject on the monitor. The obvious benefit is that a number of individuals may observe the subject at the same time. As mentioned above, this feature is especially useful when a class of school children are on a field trip and are eager, all at the same time, to see whatever is being observed. The system is also very effective for observing

Figure 4. *Detail view of LCD monitor (simulated image).*

Figure 5. *Video clip of young female Osprey (Pandion haliaetus) perched on Post, at an estimated distance: ~75 yards. (See online version to view Video.)*

Figure 6. *Video clip of pair a of White-tailed Kites (Elanus leucurus) preening on a distant scrub tree, at an estimated distance: ~125 yards. (See online version to view Video.)*

a "sensitive" subject (a nesting bird for instance) with the least amount of disturbance. By adding a longer mini cable (>100') the monitor can be detached and moved still further away from the sensitive area and viewed at a distance once the system is focused on the subject, (Figure 4).

I completed a field test (9/22/12) of the MX system at the San Elijo Lagoon Conservancy (SELC), Cardiff by the Sea, California, where I set up the equipment on an observation deck atop the Nature Center. In addition to the MX system, a Sony DSR-250 Digital Video Camera was connected via a standard RCA cable. Video recordings were captured on conventional DVCAM tape. The first subject was a female Osprey (*Panion haliaetus*) perched on a post at an estimated distance of 75 yds. (68.58 m). The ambient sunlight was somewhat mixed with a hazy marine cloud layer, and the prevailing wind was estimated at 5-7 mph (7-11 kilometers). It was challenging, but rewarding, to videotape the Osprey as she continuously scanned for fish in the lagoon below her perch (Figure 5).

The second field test that day was made from one of the walking trails that border the lagoon. At an estimated distance of 125 yards (114 m), a pair of White-tailed Kites (*Elanus leucurus*) were spotted on a scrub tree (Figure 6). The pair were busy preening, and at that distance, were oblivious to my presence. The video clip proved to be unsuccessful quality wise, but provided a valuable lesson regarding the MX's capabilities. The resulting video revealed that subjects recorded at a considerable distance are very susceptible to wind and atmospheric thermal layers. Although the MX system is impressive capability wise with its 80x CCD, practical use is limited to subjects located at <100 yards (91m).

Digiscoping with a High Definition Video Imaging System

In recent years 35mm camera manufacturers have included HD video capture as a standard feature in digital single lens reflex cameras (DSLRs). One only needs to read the online pages of *Digital Photography Review's (DPR)* camera section http://www.dpreview.com/products/cameras to do a side-by-side comparison of the cameras offering HD video capabilities. One of these, Nikon's D800 (#25480), was used to do field trials attached to the fieldscope system. Complete technical specifications and an objective review of the D800 is available via *DPR*: http://www.dpreview.com/products/nikon/slrs/nikon_d800

Setting up the fieldscope with the Nikon D800 also requires removing the fieldscope's supplied eyepiece, and replacing it with a Nikon FSA-L1 Camera Attachment (threaded). The D800 may then be coupled by its bayonet mount. In addition, a Nikon DK-5 Eyepiece Cap is highly recommended to keep incidental light from entering the viewfinder and affecting the CCD's exposure calculations. Also, Live View is the mode of choice for viewing and recording, and a HoodmanCrane & Loupe (3x) has proven to be very helpful for viewing the camera's LCD display. The rubber eyecup is very comfortable and provides the feel of

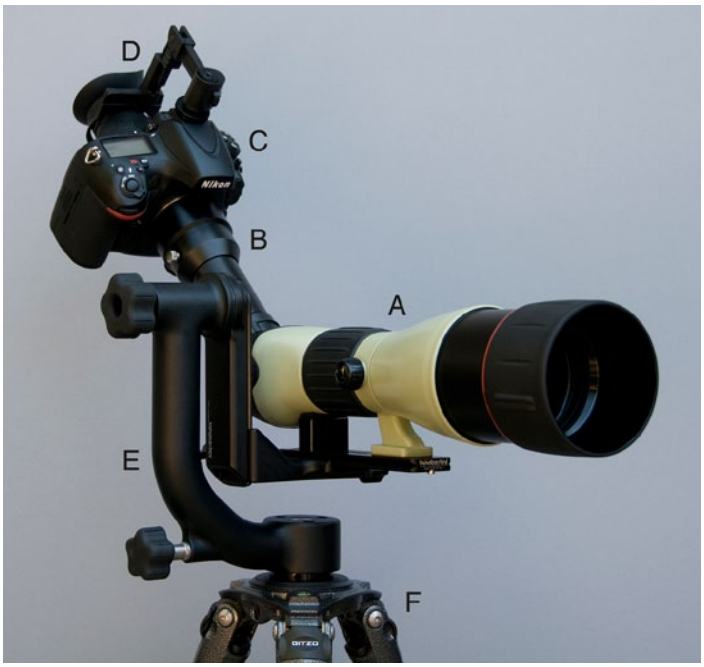

Figure 7. *A) Nikon Fieldscope ED82-A with 82mm, 1000mm focal length lens.*
B) Nikon FSA-L1 DSLR Camera Attachment.
C) Nikon D800 DSLR Camera back.
D) Hoodman HCRN HoodCrane & HoodLoupe 3.0.
E) Wimberley WH-200 II gimbal head & P50 lens mounting plate.
F) Gitzo 3532S carbon fiber (three sections) tripod.

a conventional video cameras eyepiece. An optional electronic shutter release (MC30 Remote Cable) may also be utilized to help reduce camera vibrations. The entire system is then attached to a Wimberley WH-200II gimbal head, which in turn is secured to a Gitzo 3532s carbon fiber (CF) tripod, (Figure 7).

Selection of a Tripod for Digiscoping

I cannot stress enough the importance of a sturdy tripod base from which to anchor your digiscoping system. With a professional photography career of better than forty years (almost exclusively as a still photographer) I am familiar with most standard tripods. Typical still photography tripods are made from aluminum and have three individual control handles (pan, plus front and lateral tilt). My very first digiscoping images were captured using a Manfrotto 3030 tripod, with adjustable center post; I quickly realized using all three controls was absolutely counterproductive to smooth panning and tilting. Having to twist and turn three separate hand controls, plus manually focusing the lens was a very frustrating experience. Surely there had to be a better method. Later, after seeing an advertisement for a fieldscope I noted the digiscoper was using a tripod with a pistol-grip head. I invested in a Manfrotto 322RC2 (Joystick Head Short). The unit consists of a pistol grip handle attached to an adjustable friction ball head. It proved very useful as only one hand was needed to move the entire digiscoping system in a continuous

Figure 8. *Nikon D800 HD video: Whimbrel (Numenius phaeopus) foraging for invertebrates along tidal flat. (See online version to view Video.)*

Figure 9. *Nikon D800 HD video: Snowy Egret (Egrete thula) "fishing" in a lagoon. (See online version to view Video.)*

smooth action. But it also put the full weight of the system on one hand and fatigue set in quickly. It was then suggested to me by a colleague that I use a video tripod and head. So, after looking at a number of video tripod and head combinations I selected a Bogen/Manfrotto 3221W aluminum tripod and 501HDV head (as illustrated in Figures 1, 3, and 4). I was pleased with the smoother control and ease of operation this combination provided. But I still was not completely satisfied and kept searching for a better solution. All this time, I was constantly being reminded by photographers and digiscopers I knew that carbon fiber (CF) tripods provide *the* most stable platform, cause the least amount of vibration, and are lighter in weight compared to aluminum tripods.

During the quest to find a better tripod and head, I was exposed to an experience that solidified my thinking about investing in a new system. I was on a shoot with fellow members of the Photonaturalist Camera Club of San Diego where many photographers were using very long (500 - 600mm) telephoto lenses. Most of them were shooting with their camera and lens attached to a gimbal style head on a CF tripod. I had the opportunity to attach my scope, and as they say, the rest is history. The decision was made then and there to invest in the best possible system for my digiscoping needs. I considered a number of CF tripods and selected a Gitzo 3532s (three section) model. It is capable of holding a load limit of 55lbs (~ 25kg) and has no center post. Gimbal head selection was narrowed down to three contenders, including the Mongoose M-3.6, Really Right Stuff's PG-02 Full Gimbal Head, and Wimberley's WH-200-II. I finally selected the Wimberley unit, including a P50 mounting plate

(Figure 7). The Wimberly gimbal head offers extremely accurate balance, and the panning and tilting movements are so smooth that it makes my scope feel like it's floating on air. I share all these experiences here so hopefully anyone considering investing in a digiscoping system will avoid some of my mistakes, and budget permitting will purchase the right system and be satisfied with their investment.

HD Video Field Trials

Equipped with my upgraded digiscoping sytem (Figure 7), I returned to the SELC (9/23/12). Selection of subjects was limited, but eventually I set up the system on one of the dirt trails (using the retractable tripod spike feet). A Whimbrel (*Numenius phaeopus*) foraging for invertebrates along a tidal flat was spotted and I started to video record its activity. The bird was located approximately 30 yards (27m) away at a slight low angle from the trail. The recording was somewhat successful for such a fast moving subject (Figure 8). Skill with follow focus must be mastered as the scope has to be focused manually at all times. Panning, tilting, and follow focus makes this effort a challenge. The video images were stored on the camera's removable storage card.

Later, a second trial video was made of a Snowy Egret (*Egrete thula*) that was spotted wading through the lagoon. A video recoding captured the bird's "fishing" technique. This species was located on the opposite side of the lagoon at an estimated distance of approximately 45 yards (41m) and the angle of view was virtually at eye level (Figure 9) *note:* look carefully at the clip and you can see the egret actually catch and swallow a small fish.

The HD video clips recorded on the flash card, along with the DVCAM tape were later downloaded to a Mac computer and editing was done with Adobe Final Cut Pro software.

Conclusion

Digiscoping is typically thought of as capturing only still images. However, video imaging equipment can also be utilized to view and record natural science subjects. The older Nikon MX system has been shown to be an effective tool for viewing subjects at relatively long distances (75-100 yards / 68-91m), and the viewing monitor is useful for sharing images with a group of viewers. The MX system's major drawback is that it requires a separate recording device in order to capture a permanent file. Digiscoping to capture HD video has been made possible through recent advancements in 35mm DSLR cameras. These cameras, connected to a fieldscope, enable HD files to be captured within the camera on a removable memory card. All files, either captured with DVCAM or HD, require downloading for editing. Regardless of which technology is used, the need for a quality CF tripod and gimbal head is essential for critical digiscoping. Various video capture techniques can be added to one's arsenal of tools to use for effective and successful digiscoping of natural science subjects.

Acknowledgements

I wish to thank David Freeman for his assistance in operating the Sony DSR-250 recording unit. Thanks is also extended to Alan Goldstein for the loan of his Nikon D800 camera body, and his efforts recording the HD clips. Special thanks goes to Janet Hightower for editing the four video clips (Figures 5 & 6, and 8 & 9); making a frame-grab and compositing the simulated image (Figure 4); and for creating CDs for submitting the edited files. I'm sincerely indebted to this team of professionals for their support and encouragement.

Bibliography

4th Generation Designs, Mongoose M-3.6 gimbal head http://stores.4gdphoto.com/StoreFront.bok

Brandon Optics: Digiscoping Video http://www.brandonoptics.com/Digiscoping-Video-_ep_34-1.html

Digiscoping.co.uk http://www.digiscoping.co.uk/?Cat=Video

Eagle Optics: Capture Video Footage! http://www.eagleoptics.com/articles/digiscoping/capture-video-footage

Final Cut Pro http://www.apple.com/finalcutpro/

Gitzo tripods http://www.gitzo.us/

Introduction to Digiscoping: Still Image Capture (JBC Vol. 37, Issue 2&3)

Manfrotto Tripods and Heads http://www.manfrotto.us/photo

Nikon Field Image System, *Rifle, Products Reviews, Sept/Oct 2000* http://www.riflemagazine.com/magazine/article.cfm?magid=27&tocid=381

Nikon D800 review: Digital Photography Review http://www.dpreview.com/products/nikon/slrs/nikon_d800

Optics4birding: Nikon ED82-A Review http://www.optics4birding.com/nikon-fieldscope-82ed-scope-review.aspx

Really Right Stuff, Plano-Gimbal Head http://reallyrightstuff.com/ProductDesc.aspx?code=PG-02-FG&type=3&eq=&desc=PG-02-FG%3a-PG-02-Full-Gimbal-Head

Wimberley Gimbal Head (*DPR Review*) http://www.the-digital-picture.com/Reviews/Wimberley-Tripod-Head-II-Review.aspx

Author

Robert C. Turner took up digiscoping a few years prior to retiring in 2011 from a career of more than forty years in the field of biocommunications, including more than 31 years as Director, BioMedical Graphics Department, The Scripps Research Institute, La Jolla, California. Bob is a Registered Biological Photographer, holds an MBA in Health Care Administration, is a Fellow of the BioCommunications Association (BPA/BCA), a Past President of BCA, and former Chairperson, *JBC* Management Board. He is the recipient of numerous awards, including BCA's Ralph Creer Service Award and the Louis Schmidt Award. rcturner@cox.net