An Inexpensive Webcam System for Capturing Live Skyscapes and Time-lapse Cloudscapes

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Introduction & Motivation

☺ Webcams are a common medium for the visual display of live weather conditions. Webcam systems offered by venders can cost thousands of dollars, pricing the technology out of reach for many institutions with tight budgets.

☺ The NIU Meteorology Program has developed an economical network of webcams delivering live, HD, wide-angle perspectives of Midwestern skyscapes. We employ scripts and inexpensive or, in some cases, free software to generate time-lapse movies.

☺ Time-lapses of skyscapes can transform static images of features — whose motion may appear initially imperceptible to the eye — into striking visuals with discernible fluid motion. We have used time-lapse movies in our courses to examine and explain: cloud classification, including contrail and hole-punch formation; differential advection; outflow and lake-breeze boundaries; frontal passage; gravity waves and undular bore; thunderstorm development; arcus clouds associated with MCSs (**Fig. 1**); LCL, LFC, EL, and T_c; diurnal boundary layer; stratus undulations; etc.

Figure 1: NIU Meteorology "west" webcam captures approaching shelf cloud associated with early-morning derecho-producing convective system on 24 July 2012. Time-lapse of this setting available at vimeo.com/46293492

Please let us know if you set up a system so we can view your skyscapes!

Hardware

☺ Each constituent of the network cost less than $100; this includes a USB webcam (e.g., Microsoft Lifecam; $35-70), a suction-cup window mount ($30), and a USB extension cable ($10).

☺ In order to save on equipment costs, we install the webcams on second-hand desktops running Windows XP or 7 that are 3-6 years old and that have typically outlived their utility in labs and offices (**Fig. 2**).
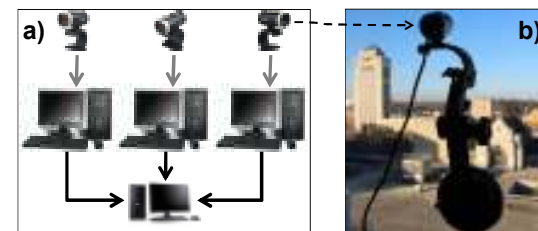

Figure 2. a) NIU Meteorology webcam system configuration that includes three Microsoft Lifecams feeding three second-hand desktops that FTP stills every 10 seconds, as well as daily time-lapse movies, to mid-grade desktop running Apache web server (httpd.apache.org). b) "North" webcam on window suction cup mount providing high-resolution images with 10 second updates.

Software

☺ We have used primarily two software as the backbone of our system: Tin Cam (tincam.com; free to try, then $19) and Yawcam (yawcam.com; donationware). Both Tin Cam (**Fig. 3**) and Yawcam interface seamlessly with modern webcams, allowing the capture of images at set intervals, sequential image save, FTPing of images, text and timestamp overlay capability, among other options such as live video streaming and auto web page generation.

☺ Yawcam has a built-in tool that allows users to convert still images to a time-lapse movie in a matter of seconds (**Fig. 4**). Despite this convenient feature, we use Tin Cam to currently run the system since, based on our experience, it is a more stable application. Details on Tin Cam setup, as well as how to create a lapse in Yawcam, are included in the conference preprint.

Figure 3. Tin Cam "Setup" interface. Menu on left reveals the numerous configuration options; in this example, "auto capture" is set to take an image every 10 seconds, save it to a log directory, and update website (which also pushes FTP).

Figure 4. Yawcam interface demonstrating the "Images to movie" option that allows an user to quickly select a sequence of images, add a frame rate (frames per second, or fps), and generate a .mov ready for playback in players that support that format (e.g., QuickTime, Windows Media Player). This feature is useful for creating movies of specific features or set periods of the day. Alternatively, this software tool can be used to create lapses of any setting that includes a series of images shot using a DSLR, an intervalometer, and a tripod. We use this method for time-lapse movie creation of cloudscapes acquired during storm chases, which we later employ in lectures.

Image and Video Distribution

☺ Using Tin Cam, we FTP image captures to our web server to display publicly every 10 seconds. In addition, live streaming is an available option in Tin Cam and Yawcam.

☺ After sunset, we run a script that uses the free FFmpeg framework (ffmpeg.org) to convert files, sequence the files, and generate a movie (in our case, .mov format) of that day's images for each camera. The script FTPs the movie file to our web server where an archive of all movies is available.

☺ We upload interesting time-lapse movies to a video-sharing website (e.g., Vimeo, YouTube) to assist in archival and efficient distribution using course management systems and social media.

☺ We have found great utility in selecting a short sequence of images illustrating a particular feature, creating an animated gif (using, e.g., Ulead GIF Animator), and including the gif within a PowerPoint lecture.