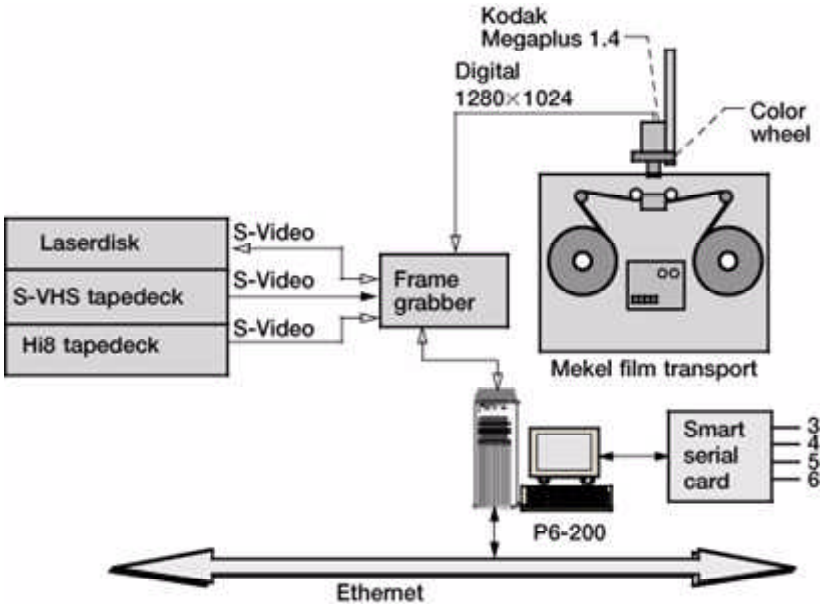
Tracker--Image-Processing and Object-Tracking System Developed



Object-tracking system hardware layout.

Tracker is an object-tracking and image-processing program designed and developed at the NASA Lewis Research Center to help with the analysis of images generated by microgravity combustion and fluid physics experiments. Experiments are often recorded on film or videotape for analysis later. Tracker automates the process of examining each frame of the recorded experiment, performing image-processing operations to bring out the desired detail, and recording the positions of the objects of interest. It can load sequences of images from disk files or acquire images (via a frame grabber) from film transports, videotape, laser disks, or a live camera. Tracker controls the image source to automatically advance to the next frame. It can employ a large array of image-processing operations to enhance the detail of the acquired images and can analyze an arbitrarily large number of objects simultaneously. Several different tracking algorithms are available, including conventional threshold and correlation-based techniques, and more esoteric procedures such as "snake" tracking and automated recognition of character data in the image. The Tracker software was written to be operated by researchers, thus every attempt was made to make the software as user friendly and self-explanatory as possible.

Tracker is used by most of the microgravity combustion and fluid physics experiments performed by Lewis, and by visiting researchers. This includes experiments performed on the space shuttles, Mir, sounding rockets, zero-g research airplanes, drop towers, and ground-based laboratories. This software automates the analysis of the flame or liquid’s physical parameters such as position, velocity, acceleration, size, shape, intensity characteristics, color, and centroid, as well as a number of other measurements. It can

perform these operations on multiple objects simultaneously. Another key feature of Tracker is that it performs optical character recognition (OCR). This feature is useful in extracting numerical instrumentation data that are embedded in images. All the results are saved in files for further data reduction and graphing.

There are currently three Tracking Systems (workstations) operating near the laboratories and offices of Lewis' Microgravity Science Division researchers. These systems are used independently by students, scientists, and university-based principal investigators. The researchers bring their tapes or films to the workstation and perform the tracking analysis. The resultant data files generated by the tracking process can then be analyzed on the spot, although most of the time researchers prefer to transfer them via the network to their offices for further analysis or plotting. In addition, many researchers have installed Tracker on computers in their office for desktop analysis of digital image sequences, which can be digitized by the Tracking System or some other means. Tracker has not only provided a capability to efficiently and automatically analyze large volumes of data, saving many hours of tedious work, but has also provided new capabilities to extract valuable information and phenomena that was heretofore undetected and unexploited.

Find out more about Tracker :
http://exploration.grc.nasa.gov/Tracker/Tracker.html.

Lewis contacts: Robert B. Klimek, (216) 433-2837, Robert.B.Klimek@grc.nasa.gov; and Dr. Theodore (Ted) W. Wright, (216) 433-5341, Theodore.W.Wright@grc.nasa.gov
Authors: Robert B. Klimek and Dr. Theodore W. Wright
Headquarters program office: OLMSA (UG)

Programs/Projects: Microgravity Science, Investigations of the behavior of flames and fluids:

On the shuttles and Mir--SSCE, CFM, WIF, ICE, FSDC, FFFT, RITSI, DCE, CHT, LSP, ELF, TGDF, ALB, OFFS, Behavior of Rapidly Sheared Bubbly Suspensions, TIGER-3D, SIBAL

On sounding rockets--SAL, DARTFire

In aircraft and ground-based facilities--Measurement of Flame Temperatures in Reduced-Gravity and other combustion experiments, Bubble Formation and Detachment in Cross Liquid Flow Under Reduced and Normal Gravity and other fluid behavior experiments, General Motors R&D Center, Engine Research Department

Special recognition: NASA Tech Brief; runnerup for NASA Software of the Year award