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Scanning Activities at Sonneberg Observatory

Sonneberg Observatory operates the world's second largest archive of photographic plates, presently containing more than 240,000 (Bräuer & Fuhrmann 1992). Scanning them will be an essential part of future activities. Some tests have recently been carried out with a new dedicated CCD line-scanner (Bräuer & Kroll 1992). The scanner was developed in collaboration with the *Lehr- und Forschungsbereich Theoretische Astrophysik, Universität Tübingen* and has recently been lent to Sonneberg for several months. The device as a whole consists of the following components:

- base, plus lighting unit of 30 x 30 cm^2 working area with 3 high-frequency, colour-neutral, fluorescent daylight lamps;
- OPTOSCAN CCD line-camera with 5100 pixels, line movable on a carriage over 7200 steps. Data depth is presently 8 bits; 12 bits will be available shortly;
- UNIX-workstation of Silicon Graphics Inc. (IRIS 4D/20);
- software 'POLYSCAN' developed by SCIENCE+COMPUTING GmbH, Tübingen;

- exabyte Cassette Drive 8500 for permanent storage.

For more details, see Kroll & Neugebauer, 1993.

The scanning process takes about 3 minutes for a 5000 x 5000 pixel frame. For a typical plate of 12 x 12 cm^2 (Sky Patrol) or 30 x 30 cm^2 (Field Patrol) the scan of the whole plate with a resolution of 10 μm should take about 30 min (or 3.5 hours, respectively), yielding about 225 MB (or 1.3 Gbytes), uncompressed.

The main focus of interest at Sonneberg Observatory is the light variation of variable stars. Traditionally the plates were inspected visually using a simple microscope or a plate comparator. The experienced investigator manages to produce 300 estimations per day, so it would take 100,000 years for one 'manual' investigator to deal with the whole Sonneberg archive (assuming 50,000 star images per plate).

In automatic mode, one aims at a determination of the brightness of all the objects on the scanned frames. The necessary software was developed by Neugebauer (see Kroll & Neugebauer, 1993), and is based on an eight-parameter fit of a Gaussian distribution of density within an image. The logarithm of the volume within the Gaussian distribution constitutes a good measurement of magnitude, and the method yields a photometric accuracy of about $0.^m05 - 0.^m08$.

At present the scanner is employed for digitising the neighbourhood (object and comparison stars) of carefully chosen objects on all plates of a particular field (e.g. HZ Her on 746 plates, BL Lac on about 500 plates) to get long-term light curves.

Although we hope one day to digitise the whole plate archive the present scanner is not appropriate for such a purpose. A new device with 12-bit output, stabilised cold-light unit, moving table and a faster computer (IRIS Indigo 4000) may possibly be available after April 1993.

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