

The Digitisation Programme at Edinburgh

The COSMOS machine at the Royal Observatory Edinburgh is a UK National Facility, and as such is available to the entire UK community, and to the Australian community through the Anglo-Australian Observatory agreement. The digitisation programme on COSMOS is driven by user demand. In this way, the optical identification programmes of (initially) the ROSAT project and subsequently the IRAS project, drove the requirement for scanning of the entire Southern sky 1st epoch UKST survey. It has subsequently been found that many other projects on COSMOS can be satisfied from the resulting processed survey data, and indeed we are now regularly servicing a much larger number of projects from the Southern sky 'Object Catalogue'.

The creation of the COSMOS/UKST Southern sky object catalogue is a collaboration between the ROE and the NRL (Naval Research Laboratory) in Washington D.C. A description of the catalogue is given in the paper by Yentis et al. (proceedings of the conference on 'Digitised Optical Sky Surveys', 1992). The catalogue was a project to process the COSMOS scans of the Southern sky IIIa-J survey (South of +2.5 degrees, $|b| > 10$ degrees) and the Short Red survey (South of +2.5 degrees, $|b| < 10$ degrees) into a database of the entire Southern sky and to install the database at the MPE in Garching for ROSAT optical identifications. Although the catalogue was completed in 1991, as a result of minor improvements which were incorporated to the processing software, the entire catalogue was reprocessed from scratch. This reprocessing has recently been completed, and as a result of community interest it has been decided to compress the catalogue (from 45 Gbytes down to approximately 5) for subsequent release on CD-ROM. Release on CD-ROM is aimed for the end of 1992/beginning of 1993.

As well as the southern sky object catalogue, the ROE/NRL collaboration has also involved the development of a comprehensive suite of algorithms for the detection of clusters of galaxies present on the photographic plate material. The procedures have been described in the same paper in the Edinburgh conference proceedings. As a result of improvements made to the Object Catalogue plus improvements to the cluster detection software, the new improved object catalogue is also currently being reprocessed to produce a new high-quality cluster catalogue from the data. The investigation of large-scale structure in the Universe from the distribution of galaxies and clusters is one of the principal scientific goals of the ROE/NRL collaboration. Cooperation with the MPE on the ROSAT data is aimed at providing a catalogue of true clusters free from biases which are usually present in other optical catalogues. The ROE/NRL cluster catalogue will become available for general use as appropriate.

COSMOS is now a fairly old machine, and the technology used in its construction has been superseded. We anticipate that the successor to COSMOS, SuperCOSMOS, will be in operation by June 1993. The design of SuperCOSMOS is based on state-of-the-art technology: granite air-bearing xy table, linear 2048 CCD array, transputers and sparcstations for data processing. Initially, we will use on SuperCOSMOS the same algorithms as on COSMOS. However, we plan ultimately to incorporate profile-fitting techniques for object parameterisation. SuperCOSMOS will have a 10 micron pixel size, a better than 0.5 micron accuracy and will operate initially at a data rate of 600 Kbytes/sec, the limiting factor on the data rate being the A/D conversion. We anticipate a plate scan time of approximately 1.5 hours, although our planning assumes a plate turnaround time of 2 hours when overheads (e.g. plate setting-up, temperature stabilising, focus map, etc.) are taken into account. Initially, we envisage an operation involving the scanning of 6 survey plates each day on the machine. The spare capacity will be used for non-survey and/or non-astronomical work.

Part of the planned digitisation programme on SuperCOSMOS has been described in the article by Hawkins in the proceedings of the Edinburgh conference. We certainly aim to produce high-accuracy, high-resolution scans of both the 1st (UKSTU-J, ESO-B and ESO-R) and 2nd (AAO-R) epoch surveys of the southern sky. In addition, we will incorporate the data from U and I surveys to produce a comprehensive database on the objects with as much colour and proper motion information as possible. The raw pixel data will initially be archived on exabyte tape, although we do not regard

this as the long-term storage medium and the data will be transferred onto a more robust medium when cost permits. The raw pixel data will be available for access, and plans are well in hand for the distribution of a highly compressed version of the pixel data for the southern sky J survey on a single CD-ROM disk.

Our plans for the Northern sky do include the digitisation of the entire POSS-II (J, R and I) material. Here, however, we will be driven by the desire for the scientific exploitation of the new higher quality sky survey in the North. In particular, we envisage developing catalogues of galaxies and clusters which will complement our large-scale structure work in the South. The Northern sky database, however, will be made similarly generally available.

Looking beyond the initial phases of our planned digitisation programme on SuperCOSMOS, i.e. that of digitising the existing sky survey material with high accuracy and high-resolution, the possibility of new deep sky surveys in the southern sky on the UKST from the use of Tech Pan 4415 film is attractive, and we will ensure that SuperCOSMOS has the capability to extract the information from film. Furthermore, recent work at Edinburgh on the co-addition of digital data has revealed the enormous potential for sets of very deep wide-angle digital frames based on plate-stacking. These two new areas combined (i.e. digital stacking of large numbers of fine-grain film exposures of the same field) will allow a rich reservoir of high-quality deep data to be tapped well into the future.

References

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- Yentis, D.J., Cruddace, R.G., Gursky, H., Stuart, B.V., Wallin, J.F., MacGillivray, H.T., Collins, C.A., 1992. *The COSMOS/UKST Catalog of the Southern Sky*. In *Digitised Optical Sky Surveys*, eds. H.T. MacGillivray and E.B. Thomson. Kluwer, Dordrecht. 67.

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