

## THE MAMA MACHINE: PROPER MOTIONS FROM DIGITIZATION OF CENTENARY PLATES

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ABSTRACT. MAMA was designed to digitize a Schmidt photograph in 2 hours, and a Carte du Ciel plate in 30 minutes, with a positional accuracy of 1 micron. Comparison of recent photographs with Carte du Ciel plates can thus be performed on a large scale to determine proper motions of stars down to visual magnitude 14 over a time interval of about ninety years. The poster presents the main features of the system and illustrates some programmes undertaken in various domains.

### 1. GENERAL OUTLINE OF THE SYSTEM

MAMA is a high speed, computer controlled microdensitometer designed to digitize and analyze astronomical photographs. It gains its speed by using a linear array of 1024 photodiodes to measure the amount of light transmitted by the plate.

A 6 x 6 inch<sup>2</sup> plate - such as a "Carte du Ciel" plate - could be digitized, at 10 micron resolution, in a time as short as 15 minutes. The corresponding data flow (300,000 pixels, i.e. 600,000 bytes per second), has guided the design of the computer configuration, composed of two subsets:

- the microcomputer system, in charge of the management and control of the microdensitometer (X and Y motions, data acquisition...)
- the real time oriented host computer, associated with an array processor and an image processing system with colour display.

### 2. DATA PROCESSING

From the basic 10 micron image element, pixels of any (larger) size can be synthesized in real time.

The array processor can also be used as a very fast tool to extract astrometric and photometric information from

the plate, in the form of a catalog containing X and Y positions as well as shape and magnitude indicators for all the objects present in the field above a given density threshold. This information can be directly interpreted, or used to re-sc~~an~~ the plate around selected positions in view of further image processing.

### 3. ASTROMETRIC PERFORMANCE

The repeatability is better than 0.5 micron over the whole XY table which accepts 14 x 14 inch<sup>2</sup> plates. The accuracy can be determined by measuring a standard plate bearing chromium disks with positions and diameters known to 0.2 micron. Classical tests ( e.g., scanning the standard plate after rotation of 90 ° ) show that the accuracy of coordinates given by the machine is better than 1 micron over the central 12 x 12 cm<sup>2</sup> area ( see the paper by Bienaymé et al., this symposium).

MAMA is operated by INSU ( Institut National des Sciences de l'Univers).