A FULLY-AUTOMATED SYSTEM OF ASTROMETRIC DATA COLLECTION AND PROCESSING

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The automated astronomical system "Astrometrist" for the determination of the parameters of terrestrial rotation (DTRP) is intended for astrometric and meteorological data collection and on-line processing and feedback to the user by a computer.

In designing the DTRP the following questions were solved: development of specialized software (SW); creation of a variety of special-purpose devices and their incorporation into a single complex; improved of the data reduction and of the reliability and efficiency of the individual subsystems.

The software for the DTRP is created in stages with proper account of the hierarchy of the system's levels. The just level (I) consists of the collection of the relevant input data. There are: the pertinent astrometric and meteorological data, the position of the instrument, instant of pointing and tracking intervals. At this level, the SW consists of assembler-languages, and a microprogram level of the computers employed and is composed of control programs for the particular components of level I and of data reduction and buffering. The SW of level II (intermediate data storage, preprocessing output of measurements and checks) consists of steering programs and diagnostic programs for level I systems as well as of preprocessing programs and data exchange programs from the computer of level I and III. Such a SW level II permits level III to gather all available astrometric and meteorological data in the form of a data bank composed of the overall memory field of the level I computer. Level III of the system analyses the input data, the establishment of the system's operation mode (collection, type of processing,etc) and of the on-line processing of astrometric data.

Level I of the system is intended for the TRP data

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collection from a network of stations, for calculating UT-1, and the coordinates of the Earth's pole, the data exchange with the users and for preparing data. Finally, the system's level makes it possible to implement its interaction with high-speed computers in order to refine algorithm of celestial mechanics and astrometry ; to develop models describing the rotation of the Earth to improve fundamental astrometric constants (nutation, precession, aberration, etc.). The data reduction is checked both by hardware check of exchangeable codes and through programmable allowance for rounding errors introduced in the computations.

Input data are provided by two Danjon astrolabes, OPL-22 and OPL-26, by a photoelectric meridian transit instrument (PMTI) and by an automated system of weather data collection (ASWDC) from a weather proble of an astrometric site. A substantial expansion of the composition of the available aids is envisaged in the future.

Presently, the information content supplied by input data sources during one observational run, is estimated as 40 kbyte, with an average data flow density of 10 kbyte/hr (2.7 byte/s). In order to desigh a simplest information model of the system, the flow may be regarded as a Poisson one with the parameter $\lambda \approx 5\ s^{-1}$.

The hardware of the system "Astrometrist" currently includes a M-6000 computer, a "Nairi-3-1" computer, program-controlled CAMAC-standard modules and an ASWDC. Work is getting underway on the application of mini-computers and microprocessor suites, intended for controling astrometric and weather installations and for collecting input data from them.

The "Astrometrist" system is constructed in three main stages:

The first resulted in a packege of applied programs for collection and processing of astrometric and meteorological data at levels I. II, and III, which makes it possible to automate the process of reducing astrolabe and PMTI data; to process aerological sounding data with a view to infer fields of the atmospheric refractive index and to calculate meteorological characteristics of the atmosphere; to calculate reductions for the inclination of air layers of an equal atmospheric refractive index in observed corrections of hours; to derive temperature field distribution in the ground layer for the times of observations; and to control a CAMAC-system of observational data input into the "M-6000" computer.

All the programs, except the last one which is based on "Mnemocode" (a M-6000 assembler) use the "Minsk-22"

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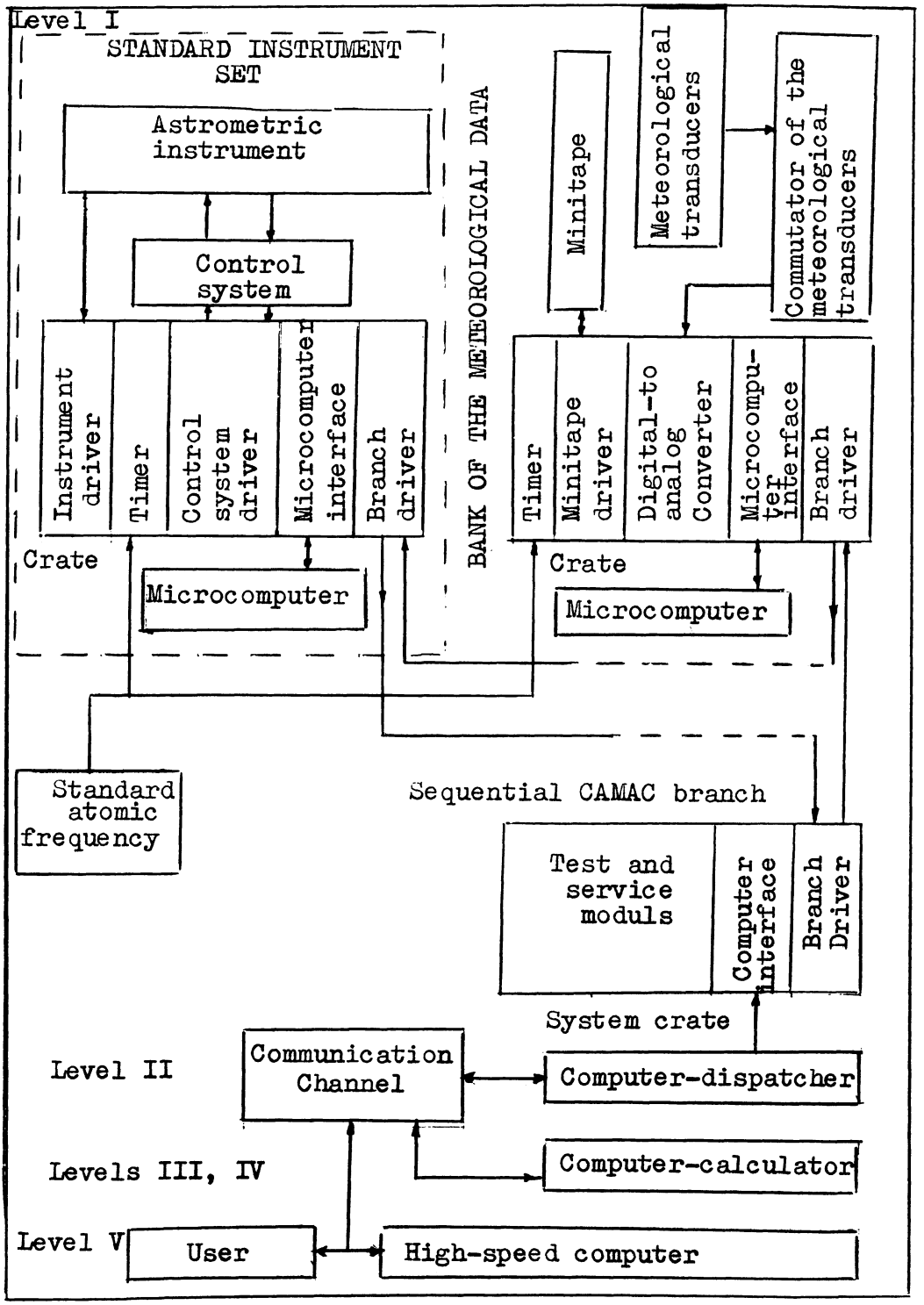

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language emulator. At this stage the data collection equipment incorporated self-contained special-purpose units with punched tape as output, and a CAMAC model.

At the second stage, "M-6000" and "Nairi-3-1" computers, time and frequency standard, ASWDC-4 and system's modules in CAMAC standard were used to construct a system destined for collection and processing of observations in real time, to develop a system of symbol processing of analytic expressions on BESM - 6 computer and to create service program packages on "Astrometrist" system control.

A layout of the system is sketched in the figure.

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