AUTOMATED PHOTOMETER AT THE SKALNATÉ PLESO OBSERVATORY

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ABSTRACT. An automated interactive photometric measuring device, fed by an 0.6-m reflector and built about a programmable desk calculator, is described.

АВТОМАТИЗИРОВАННЫЙ ФОТОМЕТР В ОБСЕРВАТОРИИ СКАЛНАТЕ ПЛЕСО. В работе описано автоматическое фотометрическое оборудование для фотоэлектрических наблюдений 0.6 м телескопом. Оборудованием управляет настольный программируемый калкулятор.

AUTOMATIZOVANÝ FOTOMETER NA OBSERVATÓRIU SKALNATÉ PLESO. Popisuje sa automatizované interaktívne fotometrické meracie zariadenie, napájané 0.6 m reflektorom a postavené okolo programovateľného stolného kalkulátora.

1. INTRODUCTION

It is the endeavour of observing astronomers to simplify and automate as much as possible the routine work which must be carried out in making as well as processing observations. The possibility of comfortable processing and analysis of observations depends on the adequate standard of obtaining them. At our home observatory we try to make use of the relatively easily accessible technical means which can be applied relatively quickly to the observations we carry out.

This report describes a device which is based on experience obtained in working with the semi-automatical measuring device for collecting photometric data in digital form (Klocok et al., 1986), which we designed, put into operation and have used in cooperation with Technical University in Bratislava. Its philosophy and architecture are similar, but it represents a qualitative innovation which completely eliminates the drawbacks of the system used previously. In designing it, we drew on the possibility of utilizing a programmable desk calculator EMG 666/B, which is capable of controlling a device connected to its I/O bus.

2. COMBINED MEASURING DEVICE

For the purpose of coordinating the photometer with the control calculator, a device referred to as the "Combined Measuring Device" (CMD) was built. The photometer has an improved filter exchange unit (FEU), an external clock, a newly built pre-amplifier, pulse shaper and discriminator and pulse counter, as well as new internal clock. The control calculator has an output to a mosaic printer (MP) and a magnetic tape cessette (MT). The block diagram of the automated photometer is shown in Fig. 1.

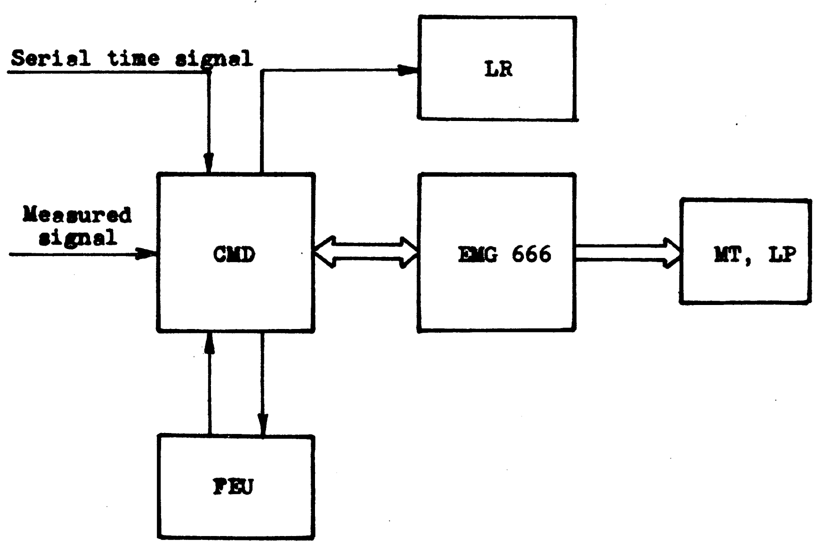

Fig 1. The block diagram of the automated photometer

The CMD has hard- and software which, together with the calculator, satisfy the following conditions: optional observing process; optional pulse integration period from the photomultiplier from 0.5 to 100 s; conversion of the serial time signal to parallel code with error correction and transmission of the observation results to the calculator; visual check of the conditions on a line recorder (LR) connected in parallel; automatic optional exchange of filters; acoustic signal indicating that the operator´s intervention is required; additional expansion to four-channel photometry is also possible.

A part of the CMD is a single-purpose microcomputer which distributes the instructions from the control calculator to the separate executive components of the device. The block diagram of the CMD is shown in Fig. 2.

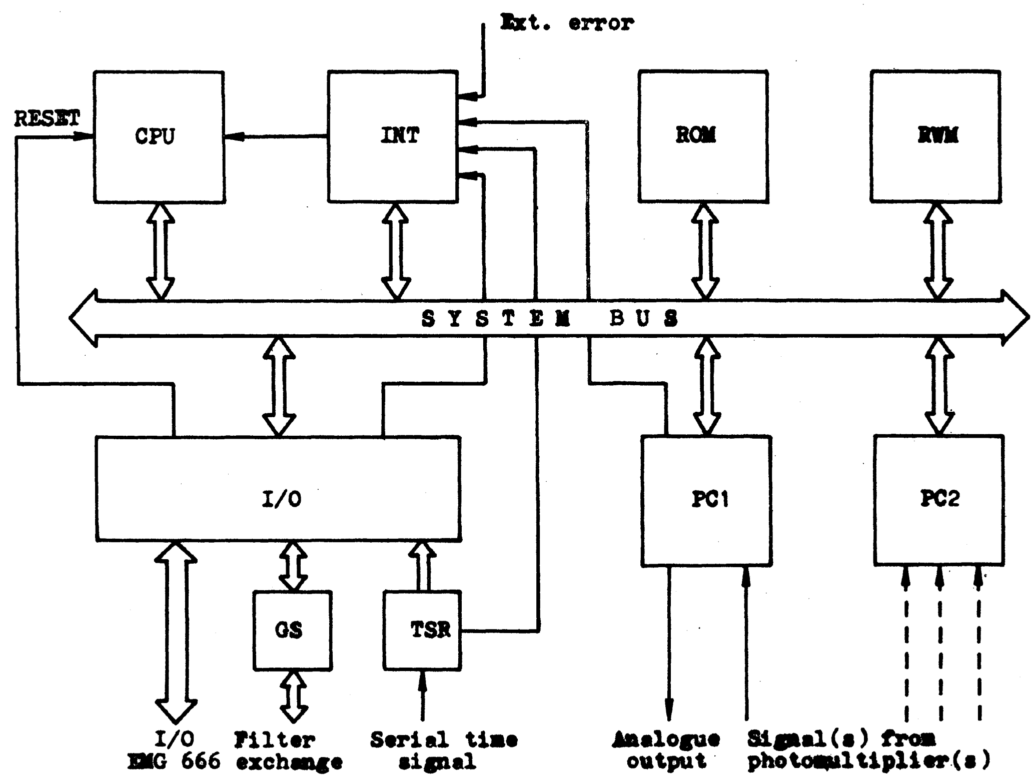

Fig. 2 The block diagram of the Combined Measuring Device

It consists of the following blocks: central processor unit (CPU) based on microprocessor 8080A; a block of interruption processing (INT), reception of the time signal (TSR), generator of the integration period; a 2 kB ROM and a 1 kB RAM memories; an input and output block (I/O); block of galvanic separation (GS) of signal transmission from the filter exchange unit; receiver of the serial time signal; decadic pulse counter (PC1) and analogue output circuits for visual monitoring of the quality of the measurements; block PC2 is reserved for connecting another three channels.

The basic software takes care of the required activities. Its individual functions are called from the program according to the requirements of the observer. These programs carry out the following functions: prohibit the interruption and initiate the CMD; generate the acoustic signal requesting the observer´s intervention; change the filters; set the integration periods; transmit time data; initiate series of measurements according to the main program.

The possibility of modifying the observation process by means of control programs, written according to individual requirements and stored in the external magnetic tape store, together with the combination of technical means used, provides for comfortable control of the device and data acquisition.

3. ORGANIZATION OF OBSERVATIONS AND SOFTWARE

We endeavoured to reduce the number of necessary interventions of the observer into the observation process (e.g. changing the filters, sequence of observation acts). The control calculator has taken care of the whole observation cycle. A series of control programs has been written, which enable various types of observation, e.g. of atmospheric extinction, of international standards for calibrating the instrumental colour system, single- and multi-filter observations of variable stars, comets, and universal programs.
The observer is able to intervene in the observation, make operative decisions by chosing options offered by the calculator´s routines. If the system is down for some reason, it can be restarted quite simply.

We have so far not made use of the possibility of reducing the observational data in real time. Nor can the telescope be automatically set to another object (comparison, check, variable). This must be done by the telescope operator.

4. CONCLUSION

The system described has been in constant operation since January 1984, and it has been used to obtain the observations published in Svoreň (1986) and Kreiner and Tremko (1986).

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