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REAL TIME PROCESSING OF DATA FROM INTELLIGENT LABORATORY EQUIPMENT

This paper presents implementation phases of a real time processing system of data from intelligent laboratory equipments. This system is hierarchically organized in three levels and it could be integrated in a global monitoring system. Intelligent analyzers with their processing units are to be found at the first level, the second level comprises local databases and the last level contains the monitoring server. Software applications of the information system allow automatic acquisition, saving and data storing from the intelligent equipment to the global database. It also gives the possibility to assess this database by different users or user groups. We deal with an open system lacking restrictions imposed either by the number of laboratory equipments that could be connected or by the number of users.

Представлены этапы реализации системы обработки данных микропроцессорных измерительных приборов в режиме реального времени. Эта система организована иерархически и состоит из трех уровней. Она может быть интегрирована в глобальную систему мониторинга. На первом уровне находятся микропроцессорные анализаторы со своими устройствами обработки данных, второй содержит локальные базы данных, а последний включает управляющий сервер. Программное обеспечение информационной системы позволяет проводить автоматизированное получение, сохранение и накопление данных, полученных от микропроцессорного оборудования в глобальной базе данных. Оно также позволяет различным пользователям или группам пользователей получать доступ к этой базе данных, где отсутствуют ограничения, обычно налагаемые либо количеством лабораторного оборудования, подключенного к системе, либо числом пользователей.

Introduction

Today we witness an important development of IT equipment, which is used in many and various domains. People who work in those fileds want to increase performances of the system that contains numerical processing units, they try to reduce the costs and increase safety in operation. Oil processing field is one of the fields that sustain IT development and its usage in the component process. The necessity of precise measurements an real time results providing is imposed by the economic development of every company. Therefore we talk about two important aspects: precise measurements and real time data processing. Better measurements in shortest time with minimum consumtion resources and without human involvement means in fact appealing to the last science discoveries in the fields of laboratory equipment and intelligent analyzers [Hofman, 1994]. On the other hand, in real time data processing each transaction must be executed as soon as data is available for current transaction.

The information system designed and implemented by the author allows automatic collecting of data from intelligent laboratory equipment and structuring it into a single database. The software applications of the system allow users or user group to access data from database and to get useful information from that data in the shortest time.

Measurement Informatical System

In modern society metrology has the obligation to create the technic and scientific base of measurements for assuring uniformity and correctness in all activities.

In the last decades of the 20th century on the level of various metrological organizations has been introduced the concept of *chemical metrology* [Buzoianu, 2001]. Like the other measurement domains, chemical metrology contains the amount of practical and theoretical aspects of chemical measurements. Therefore

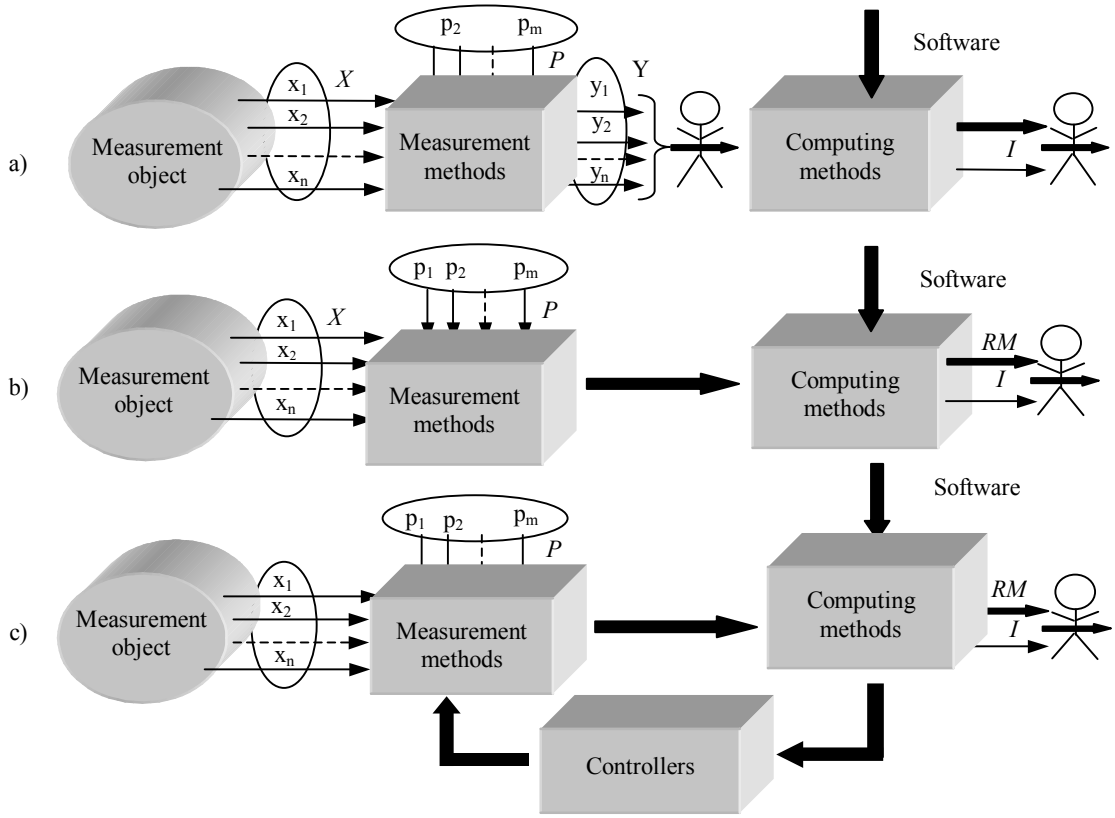


Fig. 1: a) MIS with off-line computing methods; b) MIS that uses computing methods only for processing; c) MIS that uses computing methods for processing and leading some specific functions to the measurement system; *X* – measured value; *Y* – raw measurement result; *P* – disturbances; *RM* – final measurement result; *I* – incertitude.

chemical metrology has some peculiar aspects: defining, materialization and unit measurement communication; defining and building the complex system of fiducial materials; developing basic measurement methods; developping specific infrastructure (laboratories that make measurements through basic or fiducial methods).

A Measurement Informatical System (MIS) is grouping more function blocks that are connected in an information flow in order to accomplish the measurement process. The existence of MIS has lead to develop of a new metrology section – digital metrology [Andronescu, 2001].

Intelligent measurements imply partial replacement of human help in developing measurement processes by using IT techincs [Ştefanescu, 2002]. As the informatic level grows, direct implication of the human factor is diminished to the observation stage.

The intelligent measurements appearence was based on the support given by the theory of measurement. On the other hand, intelligent measurement systems raised to measurement theory a series of complex questions , the most important being: *measurement errors*, *batch processing*, *the impact of informatics and microelectronics*. In Fig.1 are being representated ways of integrating computing methods considering the accomplishment of MIS. The alternatives shown in Fig.1a and 1b include computing methods for processing, the connexity with the ways of measurement being direct respectively indirect. As it can be noticed, the means of measurement come under *P* disturbances, which action is not compensated. The alterntive presented in Fig.1c assumes the existence, on the reacting way of some drivers that may interfere in measurement methods of correction.

Associating IT techinque at MIS is made in conformity with two conditions: assurance of the compatibilities with means the of measurement and knowing the uncertainty associated to the measurement process. Compatibility must

be realized towards the following domains: *metrology*, *information*, *energetics*, *exploatation* and *safety in operation*. Among these domains, the first and the second are very important.

Informatics compatibility implies for every MIS component the existence of the ability to participate in information transmissions without other auxiliary elements involvement. This compatibility is made by unifying communication protocol or by using standard interfaces. Such standard is IEC625 known as *Standard Interface Systems ForProgrammable Measurement Equipments.*

Tasks of (the) Real Time Processing System

Mainly, the tasks of real time processing system in which is effectuated real time processing of data from intelligent laboratory equipment consist of:

– structuring a relational database associated to the intelligent analyzers;

– creating transmission possibilities for the analyzes results that are corrected at the data concentration stations;

– developing an interface that allows data transfer to common equipment system database;

– developing an application that allows the information of various user categories about the results of the analyzes.

It is important to mention that, beside intelligent analyzers that transmit directly the result of the analyse at the concentration stations, are also situations where the final result is calculated upon both the measurement result and some corrective factors entered by the operator. In order to create this facility the informatic system should contain an application that allows the operating personal to send the correct result of the analyse.

Based on the above statements a real time processing system of data from laboratory intelligent equipment was implemented. This system is hierarchically organized on three levels which allow to be integrated in a global dispatching system [Vârbănescu, 1999]. On the first level there are intelligent analyzers with their processing stations, on the second level are concentrator stations, and the third level is for dispatcher server (Fig.2).

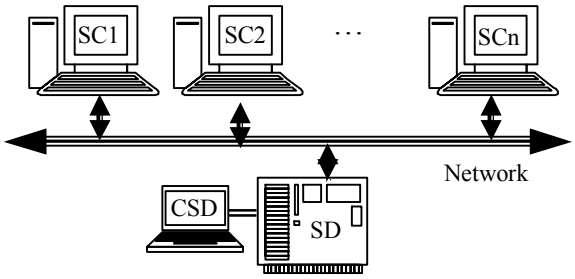


Fig. 2. Fundamental structure of levels 2 and 3 and of processing system; SC1 … SCn concentrator stations; SD – Server Dispatcher; CSD – server dispatcher working station

On the concentrator stations, data refering to the analyzes will come from personel that work in the laboratory where analyzes are made, or from the intelligent analyzers.

Information System Apllications

The applications that resolve information system tasks have been developed in web technology so that the only condition needed for accessing is to have a *browser* on the station that gives the access. Because of security reasons, the database interogation or the data introduction are preceeded by the user authetication.

Conclusions

The main purpose of the informatics system is to improve laboratory productivity by using modern chromatography methods and new IT techniques. By integrating the scientists' knowledge with laboratory robotics and analytical equipment in an automated supervisory system, the application provides intelligent reasoning and enhanced productivity within analytical laboratories.

The software application frees chemists and technicians from tedious equipment monitoring, and provides them the time to focus on valued added analysis, or research and development.

The analyzed system is an open system without imposed restrictions by the number of intelligent analyzers connected to it or by the user's number.

By evaluating the current and past chromatographic data, the informatics system gives useful information not only to the laboratory personnel but also to the managerial staff of the company.

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