DIGITAL MAPPING SYSTEM FOR EDUCATIONAL PURPOSES

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Abstract

Photogrammetry department of ITC is preparing a number of revised standard and specialized courses related to Geomatics and digital mapping which will enable students to understand the operational aspects of digital mapping in view of hardware and software components and working phases i.e. data capture, processing, archiving and storing, displaying and analysis. ITC integrated digital mapping system incorporates computer, photogrammetric, cartographic and remote sensing components. The paper deals with the role of the system in educational programmes in designing and executing the exercises and case studies, and shows the ability of the system to simulate the production lines in response to the needs of information producers.

1. Introduction

The timely availability of maps with inventory of land resources is of crucial importance for country's exploration, development and planning. The perception of needs for digital maps, its expanding rapidly and qualified personnel to manage the design, operation and maintenance of the digital map production will be needed in near future.
On the other hand the technology for digital map production is in its infancy. Only a few organizations use digital map production in their routine operational programmes. The consequence are little production experiences.
In the response to the new developments the ITC Department of Photogrammetry has developed standard educational programme related to the major functions of organizations engaged in the capture, organization and dissemination of spatial information particularly in Third World countries (fig.1).

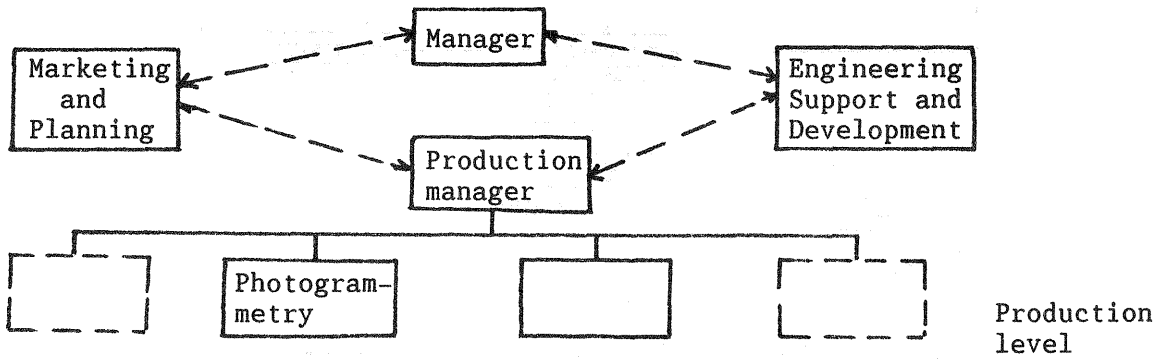

fig.1 Functional model topographical information and map production organization.

Standard educational program consists of:
- 1 year course for Photogrammetric Production Supervisor leading to post graduate diploma;
- 2 years course for Map Production Engineering Support and Development Leading to MSc. degree;
- 3-4 month course for Overall Production Manager for map production;
- 2 weeks seminar for top-executives of National Surveys and Mapping organizations.

In addition to standard programme the department has also developed "tailored" courses with specific reference to the environment in particular country:
- Course for management of integrated digital map production;
- Course for engineering support of integrated digital map production.

This paper intends to describe the concept of the integrated digital map production and to give the relevant information about tailored courses.

2. Concept of Integrated digital map production system

The concept of Integrated digital map production system (fig.2) is based on the following aspects:
- The products should be able to support user queries of topographic data for GIS operations;
- Optimal integration of data sources, techniques and facilities;
- Production environment reflecting facility, management and maintenance;
- Support conventional base mapping.

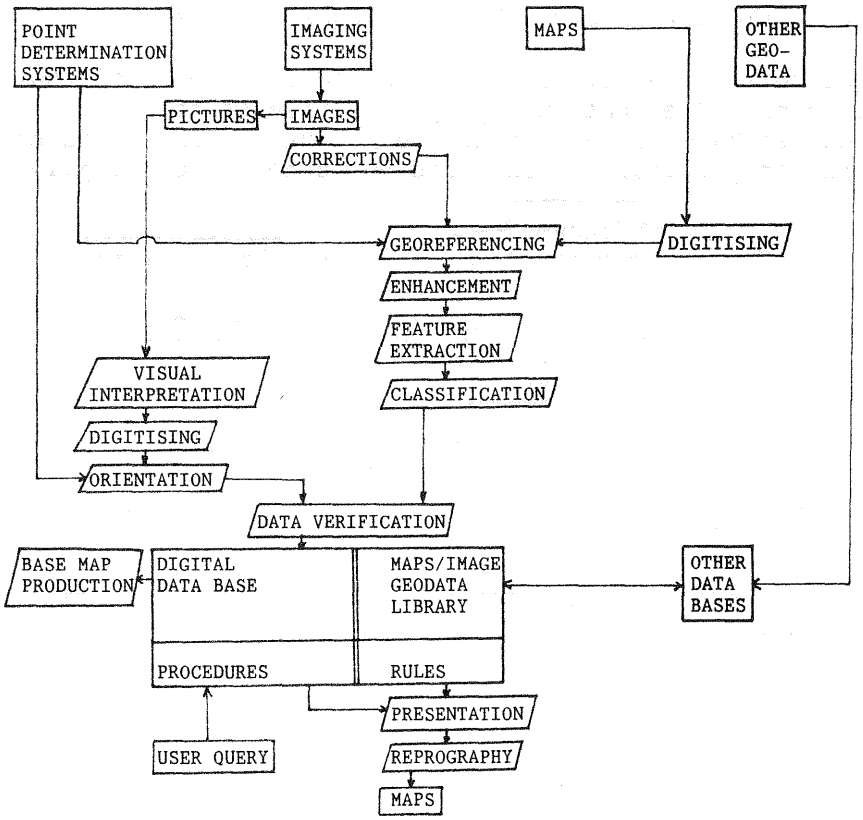

Figure 2: Concept of the integrated digital maps production system

User requirements influence the data base content, its data structure and data organizations and data format characteristics.

Integrated digital map production system employ different components for data collection (position determination systems, imaging systems, digitization of maps and other geodata), data processing methods (computer assisted photogrammetry, computer assisted cartography and digital image processing) and data presentation.

Data processing and presentation methods are realised as production lines in the system reflecting aspects of management (cost, personnel, maintenance). Digital techniques in the system for digital map production support also the relevant phases in conventional map production.

3. Courses design

The concept of Integrated digital map production system is used to design special courses for management and technical support levels. The difference between these two levels is made in accentuating the relevant functions of the system (fig. 2).

3.1 Course objectives

3.1.1 Management level

The objectives of special 4-month course for management level are the following:
- Link data sources to user defined products through the use of integrated digital techniques;
- Issues related to design and implementation of digital topographic database;
- Management of facilities (hardware and software maintenance, documentation and security of the system management of archived data);
- Quality control and system performance characteristics (in terms of costs and reliability).

The entry requirement for this course is university degree with managerial experiences in map production environment.

3.1.2 Technical support level.

The staff at this level will be responsible to transform concepts into system design, conduct problem analysis, evaluate the proposals and design changes to the system.
A one year course was designed with the following objectives:
- Examine the feasibility study to create integrated digital map production system in terms of system environment, system acceptance, technology available etc.;
- Perform the functional design of the system defining its overall functions reflecting user requirements;
- Perform technical design of the system defining data sources, hardware and software components for data collection, processing, modeling and presentation;
- Perform the prototype of the performance in terms of reliability and cost;
- Transfer of knowledge within production or education organization.
  The entry requirement for this course is university degree with production experience in one of mapping disciplines (surveying, photogrammetry, cartography or digital image processing).

3.2 Subject areas of the courses

For the design of the content of the courses the following general subject areas were identified for Integrated digital map production system:

- Planning and management of integrated mapping activities and processing techniques for production of topographic and thematic databases and their updating;
- Structural model for the interpretation, extraction, classification, coding and presentation of topographic entities using integrated digital mapping techniques;
- Integrated data collection, processing and presentation system including computer assisted photogrammetry, cartography and digital image processing;
- Geo-information data bases including decisions on contents and data structure, archiving and storage, retrieval and presentation, distributed data bases and computer networking.

3.2.1 Management level

Emphasis is put on examining the various alternatives in production, decision making on information contents, specifications and optimization of processes.
Course for the management level consists of blocks, relating the relevant lectures and exercises. The content of each block is the following:

- Introduction to integrated digital map production system;
- Technology update (computer operation, selected subjects from computer assisted photogrammetry, cartography and digital image processing with related exercises);
- Case study consisting of technical design of production line (DTM production line, digital map revision production line);
- Principles and functions of geo-information data bases;
- Facility management.

3.2.2 Technical support level

The content of the blocks for this course is oriented towards system design, optimization of various processes and quality control. Blocks and subjects are the following:

- Introduction of concepts of geo-information systems with introduction to information theory;
- Basic knowledge (applied mathematics and statistics, computer sciences, imaging systems, position determination systems, cartographic projections, databases, data structures, database management, data manipulation);
- Integrated data collection, processing and presentation (data collection from images, maps and other sources, data verification and conditioning, data presentation);
- Management (facility management, testing, quality control);
- Project (design of the digital production line for topographic data and perform the modelling according to specific user query);

4. ITC integrated digital mapping system:

Figures 3 and 4 outline the various hardware and software components of ITC integrated digital mapping system. System hardware components consist of photogrammetric analytical and computer supported plotters, digital image processing, facilities and cartographic digitizers, plotters and interactive graphic stations. Software components of the system support the data collection from different subsystems and data transfer, data editing, verification, archiving, storing and data presentation. The system is used for realisation of exercises, case studies and projects for courses for managerial and technical support level.

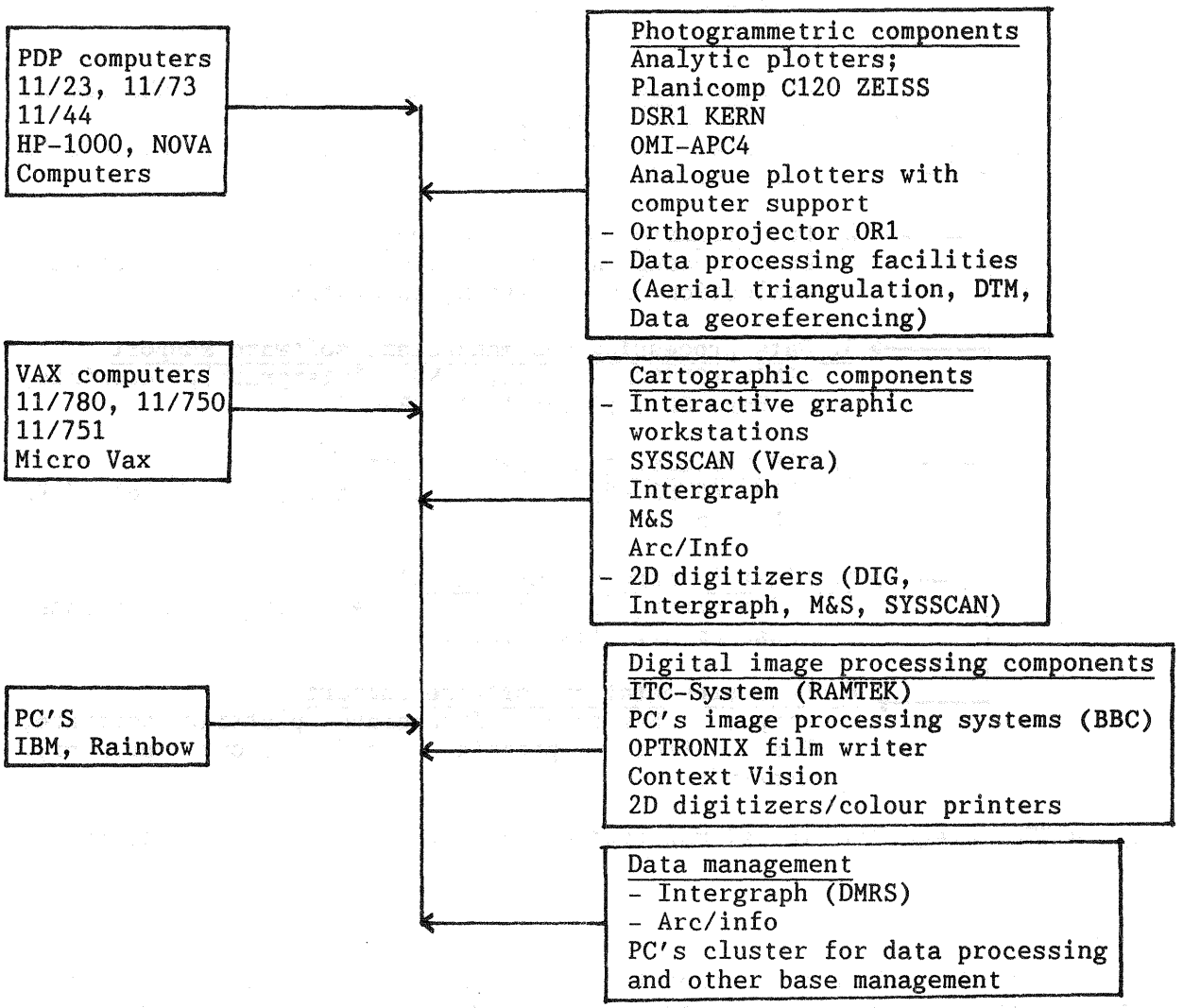

fig.3 ITC Integrated digital map production system (hardware components)

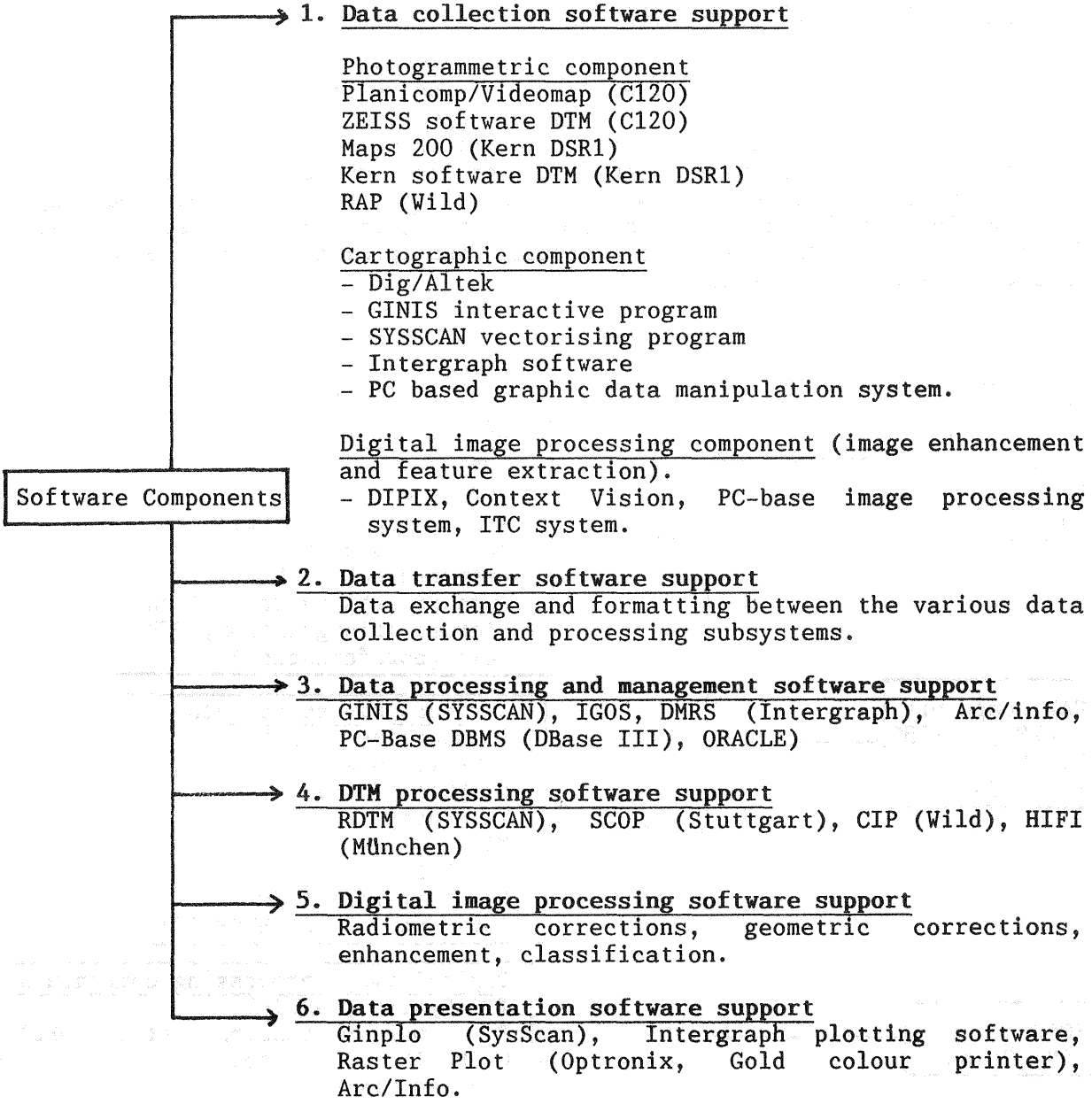

Fig. 4 ITC integrated digital map production system (software components).

5. Conclusions

User oriented tailored courses for managerial and technical support level emphasis the design and management of integrated digital map production which brings into education environment new perspective. Course participants bring with them practical experiences in mapping and surveys and educational staff contributes with their skill and knowledge in digital mapping.

Up till now three courses for managerial level were completed. This year technical support course will start followed by two courses for managerial and for technical support level. The duration and the content of the courses will be adopted to specific user requirements.