

The new generation of digital information
processing system

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Abstract

This article start with the introduction of DIPNET-880 and discusses the concept of new generation of digital information processing system. It is different from traditional image processing system developed in 70th such as the commercial system I S. DIPIX because of the developement of remote sensing and computer technology. The new generation of processing system is based on very powerful super-microcomputer workstation network, contributed and parallel processing. The logical consistency of demand for pipeline processing and specilization of processing and the global application of a distributed information system, will show the great advantage and practicability. In the network, there are geometric workstation, GIS data processing workstation, image analysis workstation and digitized cartography workstation etc. each has it's special application and support each other.

The first generation of image processing system is function-oriented, but pure image processing function is not yet practical

For solution of a lot of concret application, naturally, the new generation joinning image processing and graphic processing

function is application- or objective-oriented and supported by GIS system. just as DIPNET, it must be a more sophisticated digitized information processing system including different kind of workstation which has the capability to output digital products , in the field of processing and application, they are "interface" for each other.

1. The DIPNET digital processing system:

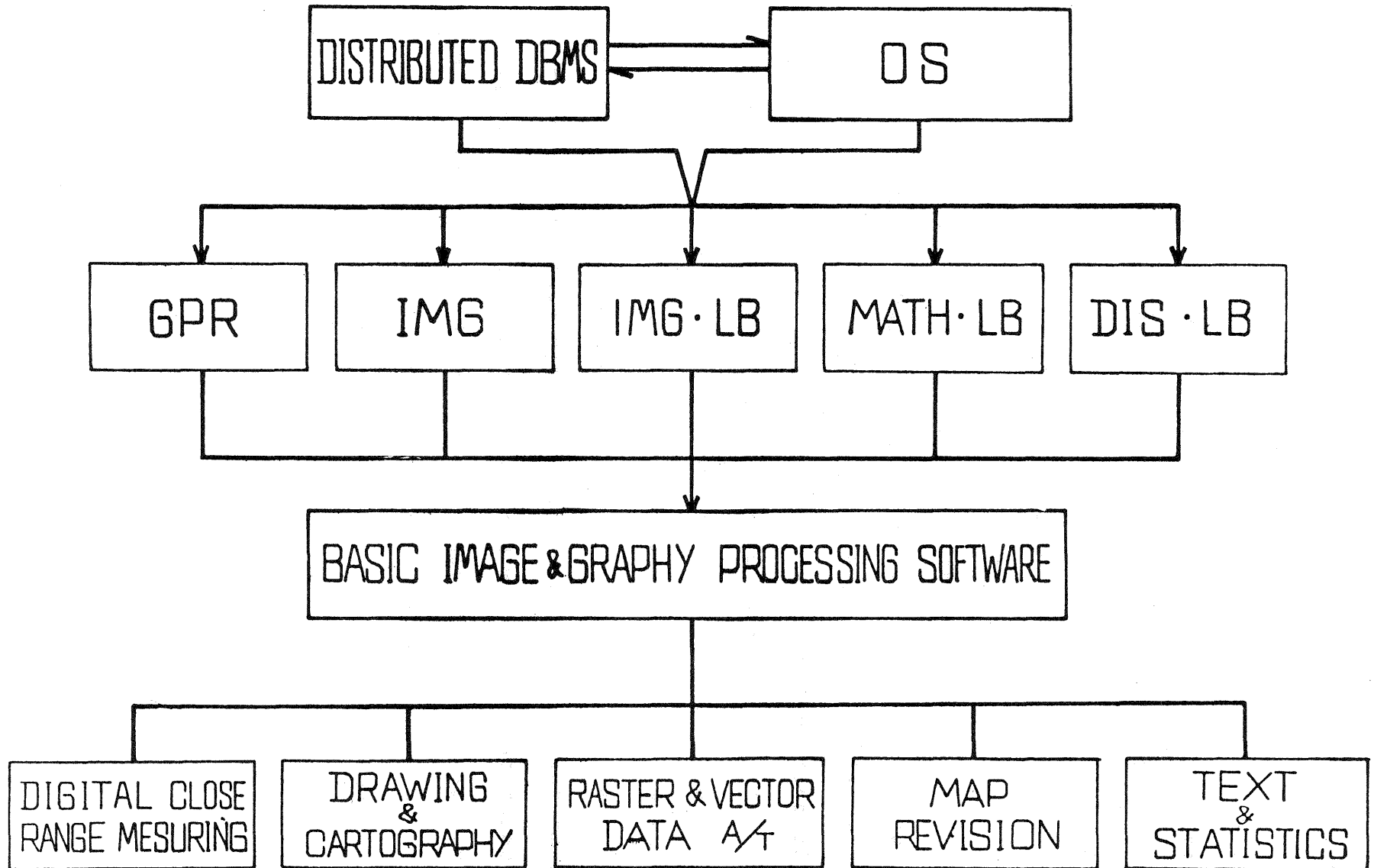
Under the cooperation of chinese reseach institute of S&M and MEDAS CO. LTD in HONG KONG, A new digital information processing workstation network system called DIPNET (DOMAIN INFORMATION PROCESSING WORKSTATION NETWORK SYSTEM) has been developped. It's logical structure as figure (1).

(1)The systematic design of DIPNET is application-oriented, and it's application software located in the lowest level can support multiple parallel processing workstation which will provide independently the products.

(2)It is different from these image processing system developped in 70th, DIPNET combines the APOLLO's perfect grappic function, based on multi-bitmap processing and "graphic element" concept, and the image processing and cartography function developped by RISM in DN 4000 recently. This part of software, based on which different specific applications is developped, is concered as the basic image and graphic processing level under the O. S.

(3)DIPNET developped the GIS data acquisition and processing software, because of the application-oriented design, It is very easy to develope a "interface" to future GIS system.

APPLICATION-ORIENTED ORGANIZATION



With these characteristics DIPNET is distinguished from traditional image processing system, and become the new generation of digital information processing system which can process different data including the remote sensing and GIS data. In the design and disposition of hardware DIPNET adopted the advanced technology of BOTH; In procedure of data processing, the mode, in which the parallel data processing and digital products output is conducted in several workstations, is adopted instead of time-shared and multi-user mode. so that, not only the data processing is the utilization ratio of computer resources is increased but also a favourable environment is provided for more intelligent application software developing and creation of artificial intelligence system.

The performance of rapid parallel processing and I/O of DN 3000 or DN4000 workstation make it possible for DIPNET to provide the necessary productivity for practical application. It can be used to conduct geometric correction, which usually spend computer time too much, and make a intelligence classifier. comparing the system supported by mini-computer and developing image processing system with microcomputer, the performance/price of DIPNET is more competitive.

According to the need of application, DIPNET combines graphic function with image processing function. Because of the bitmap processing and high resolution display capability, It is effective to realize graphic data transformation, drawing on the screen, editor and revision, overlaying graphic with image, and other graphic pro-

gress in a great deal application, but it is very difficult and time-consuming for using pure image processing to extract the useful spatial information from a image in which the spatial and spectral resolution is limited. Generally resolving a lot of problem does not depend on this or those algorithm, the decisive factor is still the physical quality of image. For exemple, the scholars have spent a lot of time and energy for studying edge extraction or landuse classification, but up to now the progress is still not outstanding. So that, beginning at 80th, the studying object gradually turn to process and synthetically utilize multi-data which is relative in time and space including aerial and space remote sensing image, geography and map information, field investigation and statistics data, etc. it brings the graphic processing the same importance as the image processing in new generation of processing system.

At present, in remote sensing application and in the most case dealing with the geoscience aerial remote sensing image is still the basic data which is easier for acquiresition and practical application, for satellite data, it's dynamic characteristics of short repeat period and big coverage is utilized. Because of the rapid developement of computer technology and resolution increasing of display device day by day, graphic workstation can do drawing, editor and revision, legend and synbol anotation, overlaying graphic on image, area and length calculation, colour and stereoscopic display, stereophotogrametry etc, which is generally processed in photogrametric instrument system. Moreover, the workstation

cessing function. So DIPNET has an extensive application for cartography and GIS data processing.

Having above-mentioned characteristics of DIPNET, It is good for processing and application of spatial and attribute data in the field of updating map and thematic mapping, landuse evaluation, urban planning, dynamic supervision of renewable resources, and another remote sensing application.

2. Image processing--information processing:

As an independent discipline, image processing has been developed for a long time. Only in the case of successful launching of earth resources satellite in 1972, for better analysis of MSS image, the image processing technology got the extensive application progress in the remote sensing image processing. But from 1972 up to now, a quantity of practice have been showing that pure image processing technology is far from the solution of different practical problem in remote sensing application. Especially since the precise sensor with high resolution and different type of data collection system have been developed, and the needs for acquiring dynamic variation of resources and environment are more and more increasing. A lot of remote sensing application demands more complicated processing and quantitative analysis, and join extensively with GIS system, resources and environment evaluation system, and another information system. Now depending on only image processing technology it is impossible to resolve so many complicated problems which has the demand of high practicality and accuracy.

Since 1972, although image processing technology has made pro-

has advantages including big visual field, powerful graphic and image processing function, convenient updating and access after digitizing. So digital processing system will have the more competitive performance/price than traditional photogrammetric instrument system day by day.

This shows, the new generation of digital processing system used to process the remote sensing and GIS data should have not only more advanced image processing function, but also the three dimension spatial data processing capability that a digital cartography system and photogrammetric instrument system possess. So we call it digital information processing system, and DIPNET is embryonic form of such system.

3. the workstation of DIPNET system:

The workstation of DIPNET can be a series of workstations, of which each is a independent pipeline, also several relative workstation can be combined for saving the budget (even combine to a single one), according to the need and possibility the user can develop the system based on domain network.

(1) Geometric workstation:

Using aerial or space image and through rectification and digital mosaic the photomap or orthophotomap is produced. The control points for rectification can get directly from more large scale map. According to the need, the sub-image library of control points can be established. The I/O of image analysis, map revision and thematic cartography, and GIS data processing workstation will take the geometric workstation as a "interface".

(2) DEM workstation:

The DEM data captured by digitizer and photogrammetric altitude data collection system will produce intersection, slope, slope direction, volume etc digital products. or DEM data is used to revise or produce contour line on the map. contour line and topographic structure lines will maintain the original histogram mathematic precision.

(3) image analysis workstation:

Starting with multispectral data, aerial and space remote sensing data, geographic and map data are synthetically used to extract thematic information through professional multi-layer classifier. The multi-layer classifier is gradually intellectualized and faced to intelligence system.

(4) Map revision workstation:

Geometricly processed image "send" to this workstation and overlay with coverage of original base map, then, the variation of single feature including drainage, residential site, landuse, traffic line, and so on can be updated. The contour line can be taken from DEM workstation. after digital anotation of legend, symbol, and coordinates grid, updated sheet will be output.

(5) GIS data processing workstation:

The map feature can be divided into several single features for processing, storage and updating. With concept of graphic element, the features including landuse, residential site, traffic line and administrative division boundary and center etc. can be vectorized and storaged; the drainage including rivers, lake,

reservoir will be stored in the mode of compressed raster data.

(6) Thematic data processing workstation:

Based on the relative single geographic features, which is captured from GIS data processing workstation, operator overlay the thematic or statistics data on it, the result can provide different evaluation, prediction, and decision information to economic decision department.