VI-106 A STUDY ON THE DEVELOPMENT AND UTILIZATION OF A PC-BASED INTEGRATED GEO-TECHNICAL DATABASE SYSTEM.

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INTRODUCTION: Studies on the development and application of a geo-technical database system (GDBS) have been carried out by institutions, universities, administrations, local self-government bodies, etc. since the 1970's. And a number of systems have been already constructed and reported [1]. The authors have researched and developed a practical integrated GDBS which can be run on personal computers(PC) [2],[3]. Easy use for geo-technical engineers as a concept has been kept through out this work.. Features of this GDBS introduced the newest computer technology: (1)Object Oriented programme technique; (2)Relational processing, etc..
This paper introduces the main functions of the present GDBS, and reports a result of performance test.

DESCRIPTIONS OF THE SYSTEM

1. ENVIRONMENTS AND HARDWARE REQUIREMENTS: The GDBS was developed under the MS-Windows(3.1/95/NT). This enables the user to run it on most of PC since the MS-Windows became the main OS for PC. The GDBS was written in C language (C/C++) with Event Driven technique. To run it comfortably under the Windows-95, hardware as specified bellow are required: (1)Intel-Pentium processor; (2)16MB or more of RAM; (3)at least 1024×768dots high-resolution device; (4)at least 100MB free space of hard-disk.

2. INSIDE STRUCTURE: As shown in Fig.-1, a global structure of the GDBS is divided into 5 units:(1)DB-files controller; (2)memory manager; (3)graphics manager; (4)print manager, and(5)external application inter-face. Each of the units consists of structured modules, so that the improvement or update of the GDBS is simplified. The relational processing technique is applied to the query of DB-files through an exclusive inter-face.
Even if an enormous amount of data is sampled, the memory engine enables a fast memory mapping and quick access, and the response time is shortened sharply. The sampled data is recognized as a data object shared with modules, therefore the GDBS is made up an object oriented DB-system.

3. I/O FUNCTIONS

(1) DB-Files

Both the vector and raster format are applicable to the positional information such as background maps, layout of constructions etc.. The Borland-Paradox table controls the index of the bore-hole and construction information, etc.. Description of soil-log, soil test results, etc. are saved in ASCII-format files, one can edit them using a marketed editor program.

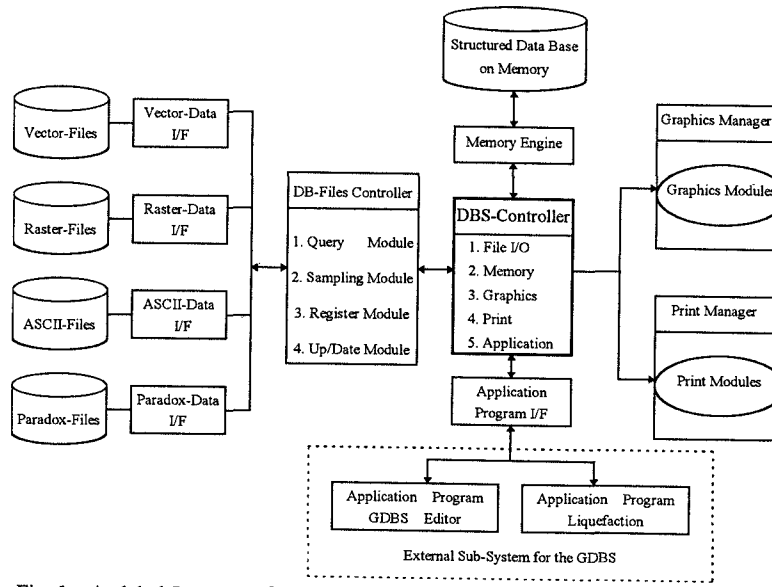

Fig.-1 A global Structure of an Integrated Geo-technical Data Base System (Ver. 1.0)

(2) Graphics and Prints: The prints have the same functions as screen images, and enable you to obtain the same color results as screen images. The world coordinates enable you to zoom your drawings freely.
The main of graphics or prints are as follows: (a)tables and ledgers (bore-hole and construction information, results of soil tests, safety factor of liquefaction); (b)plane figures (registered maps and contours); (c)cross sections (soil-profile, etc.); (d)figures to decide or assess design conditions (soil-logs, results of soil tests, integrated figures of depth-distribution and correlation for soil material properties).

(3) External Applications: The sub-system of the GDBS includes two external applications: (a)Editor program; (b) Liquefaction evaluation program. Both applications have graphical user interfaces. The editor program is capable of creating, registering, updating and printing the soil-logs or results of soil tests. The liquefaction program can be run independently of or associated with the GDBS. For the latter, once an area is selected, boring data in the selected area will be immediately sampled by the GDBS and transferred to the liquefaction program. Upon the completion, the programme return the computation to the GDBS to enable it to generate digital maps or contours of liquefaction potential.

PERFORMANCE TEST (PT) ON PC

To grasp performance on a PC, two conditions of PT have been conducted. (1)Test-A: Reading data from about 1000 sampled boring points in a selected area and drawing the N-value depth-distribution figure,(2)Test-B: Drawing the upper elevation contours of a base-layer obtained by computing about 1000 boring data. Totally 15 MB registered information which consists of about 1600boring points are used in these tests .Four configurations of marketed PC in hand are used. Turn around time(TAT) are measured by a stop-watch. As shown in Table-1, because the main part of TAT is the query and memory mapping time, there's no much difference between Test-A and Test-B for same PC. On the other hand, there is much difference in TAT depends on system configurations, however all of them are faster than predicted. In case of a Pentium-133 PC which is classified a middle range at present, TAT is in the range of 278-303 sec.. As a result of a latest computer technology, the speed is improved since the same operation took longer time even on main frame or engineering workstation. This tests are not a typical so-called "Bench-mark-test", however they give us adequate information to judge whether it is a practical system or not. Judging from the results, a low-cost and utility database system can be constructed by the GDBS.

Table-1 Results of Performance Test *1

PC *2	CPU	Clock (MHz)	Memory (MB)	Test-A (sec.)	Test-B (sec.)
98	i486DX2	66	42	739	729
98	Pentium	90	32	392	356
98	Pentium	133	32	303	278
AT	Pentium	166	32	222	209

*1: Tests are conducted under the Windows95 OS
*2: 98 ; NEC PC-9800 series, AT ; IBM/AT compatible PC

CONCLUSION AND FUTURE WORK: A PC-based GDBS has been developed and applied to the experimental registered geo-technical information. Performance test proved its practicability and flexibility.
The next objects of the GDBS are as follows: (1) The advancement of portability for easy field-use; (2) The reinforcements of the network function to recommend use of the GDBS on the local area network or wide area network. We'd like to recommend the improvement of the present GDBS in the future.

REFERENCES: [1] Committee report-I 1991, Proc. of Symposium On the geological information data base, JSSMFE, pp.6-11. [2] S.Nishie & K.Goto, et al. 1995, Development and utilization geological data base system linked site & facilities information, Proc. of the 30th Japan National Conference On SMFE, JSSMFE, pp.1-4. [3] K.Ishikawa, T.Kambara & K.Goto 1996, Applying Geo-database to Earthquake Damage Study -Examples-, Tsuchi-to-Kiso,JGS,Vol.44,No.3,pp.16-18.