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Recent activities in development of strong motion array record database in Japan

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Introduction

A number of organizations have been carrying out the strong motion observation in Japan. Among these organizations, Port and Harbor Research Institute, Ministry of Transport, has been providing a great amount of significant records by magnetic tapes for 15 years. Some other organizations such as Building Research Institute and Public Works Research Institute, Ministry of Construction, Japan Meteorological Agency, etc., have started to release some parts of strong motion data obtained from many single stations. These data have brought a great progress to earthquake engineering.

On the other hand, a number of strong motion array observation systems have been settled for the last 15 years by public research organizations, universities, and private companies. The records obtained from these systems have contributed to understanding of the earthquake ground motion including the complexity of the ground motion distribution caused by local geological conditions. These data have been processed according to the individual forms of each organization, and most of the data were used only for the objectives of researchers in each organization. There are few organizations that have developed their own database and make the data open to the third party (Katayama, et al., 1990).

Needless to say, it is very important task to regulate a common format for array records and promote mutual use of data, specially in case of Japan where many organizations keep their own strong motion records separately. In this report, the recent activity in development of strong motion array record database is introduced and the system design of the database is outlined.

Organization for Database Management

In May 1991, the database advisory committee (Chairman: S.Omote, Vice-chairman: T.Katayama) and its working sub-committee (Chief: H.Kameda) were organized in the Association for Earthquake Disaster Prevention for development of common database for strong motion array records in Japan. The members of the committees consist of earthquake engineers and seismologists at universities, public organizations, and private companies. This database project has originated from the investigation and discussion done by the committee for strong motion array (SMA) established in the earthquake engineering section of JSCE (1988) and the activity for the development of array record database by 16 Japanese organizations (1987).

Figure 1 shows the database management system which has been discussed earnestly and regulated considering the particular situation in strong motion observations in Japan. The points of the management system are as follows.

a. The database consists of the strong motion array records supplied by many organizations that have been carrying out strong motion observations.
b. The finance for the development and maintenance of the database system, publications of reports, and other miscellaneous expense are covered mainly by the funds supplied by private companies.
c. The success and expansion of this database system depend strongly on reliance between data supplier, data organizer, and user.

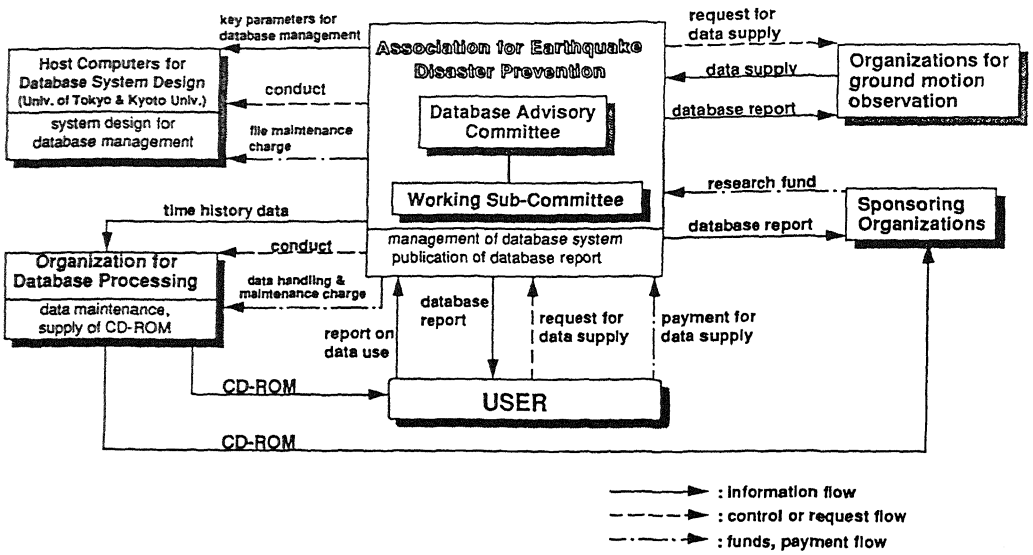

Figure 1 Database Management System.

As of July 1992, 19 organizations have jointed to this project by supplying array records and research funds, and the database system is in the process of development.

Data Organization in Database System

One of the typical characteristic of the array observation records is that a lot of relevant information is included for each component of time history records. These include the geometrical relation of installed seismometers in the array system, component of recording, soil condition around the seismometer, and recording time, etc. It is required for the database system that the parameters and data can be referred easily and precisely regarding the various types of engineering use. The technical system design discussed in this committee is in the following.

One of the fundamental functions required in the general database is termed 'data independence'. Considering this factor, the parameters regarding strong motion array records and time history data are classified into 5 categories. They form 4 tables and data files of time history records.

(i) **Earthquake Table** (information on earthquakes)
The parameters regarding earthquakes are arranged and stored in this table. The formats of these parameters follow those regulated by Japan Meteorological Agency.
(ii) **Seismograph Table** (information on seismograph)
The information on seismographs include many factors. These factors which characterize seismographs can be classified into 5 categories. The seismograph code number is determined according to this classification rule. The code number is given as a number of 5 figures for each individual seismographs.
(iii) **Observation station Table** (information on observation station)
The information on observation station is organized and stored in this table. The parameters are classified into 3 groups according to their attribute.
(iv) **Strong motion record Table** (information on time history data)
The parameters accompanying time history data are organized and stored in this table. They are classified into 2 groups. In the database, the time history data are stored in CD-ROM. Each data file consists of a header and a set of records for a single array system for one earthquake event. Therefore, one of the tables is arranged to consist of the parameters on each file, and the other on each component of time history.
(v) **Time history data**
Time history data are stored in CD-ROM. Each data file includes a header at the top of the file and a set of time history records. There files can be referred according to the parameters stored in the strong motion record table.

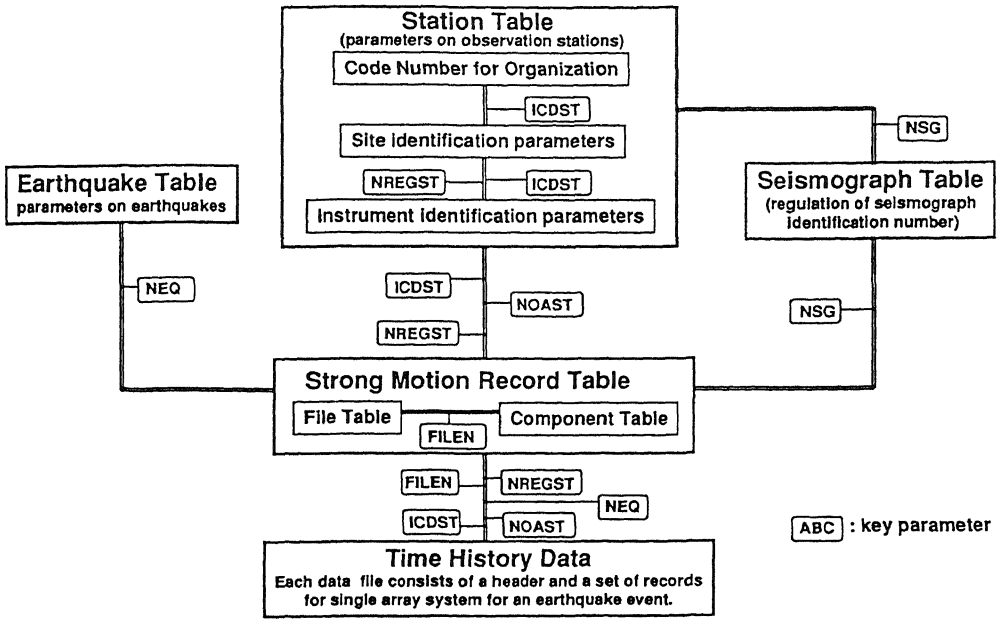

Figure 2 Organization of Relational Parameters and Time History Data in Array Record Database.

Figure 2 shows the organization of the tables and data files in the database system.

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