# Tsunami Digital Library

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**Abstract.** In this paper, we present our Tsunami Digital Library (TDL) which can store and manage documents about the Tsunami, Tsunami run up simulation, newspaper articles, fieldwork data, etc. We offer a multilingual interface. Currently some documents and explanations of the Tsunami videos have been translated into English and French. We are convinced that TDL will support many people who want to mitigate the Tsunami disaster and to plan countermeasures against the Tsunami.

## 1 Introduction

In 2004, the world has been struck with the biggest Tsunami in the Indian Ocean. Governments all over the world have since rallied to help developing countermeasures that mitigate such a disaster. In Japan, however, as the archipelago has often been a victim of the Tsunami, there has always been a continuous research on the matter. There are a lot of documents recorded these disasters more than a thousand year. Reports on the Tsunami records date back to the eighth century. In 1960, Japan archipelago has been struck with the big Tsunami from the Chilean Earthquake. Therefore many countermeasures reports have been offered by the Japanese government, many prefecture offices and city offices. Focus on the Tsunami mitigation includes the Tsunami run-up simulation, fieldwork investigation to capture damages in several formats (videos, pictures and descriptive reports), etc. But people who live along the coast, struck with the Tsunami repeatedly, cannot refer these documents easily. In this paper, we present our Tsunami Digital Library (TDL) [1] which can store and manage documents about the Tsunami, the Tsunami run-up simulation, newspaper articles, fieldwork data, etc. And every people who want data about the Tsunami can get information through the internet. We also offer a multilingual interface. Currently some documents and explanations of the Tsunami videos have been translated into English and French. We are convinced that TDL will support many people who want to mitigate the Tsunami disaster and to plan countermeasures against the Tsunami.

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## 2 Tsunami Digital Library System

### 2.1 System Overview

We digitalized materials concerning the Tsunami, and made the XML data including Dublin Core. Documents were converted into text by human, for example, handwriting brush records were read by experts, and also type documents were recognized in part by the automatic character recognition system. We stored them into Digital Library. Also we implemented partial documents retrieval from XML documents. Fig. 1 shows the structure of our TDL system. We used Oracle10g Database system to store XML Tsunami data, PostGIS Database system to store fieldwork related data and a video server to store the Tsunami run-up simulation (CG) which simulated and estimated by a past Tsunami records in some regions. We also provided a TDL Portal Server to manage the heterogeneous databases and to allow users to access easily a various types of the Tsunami data.

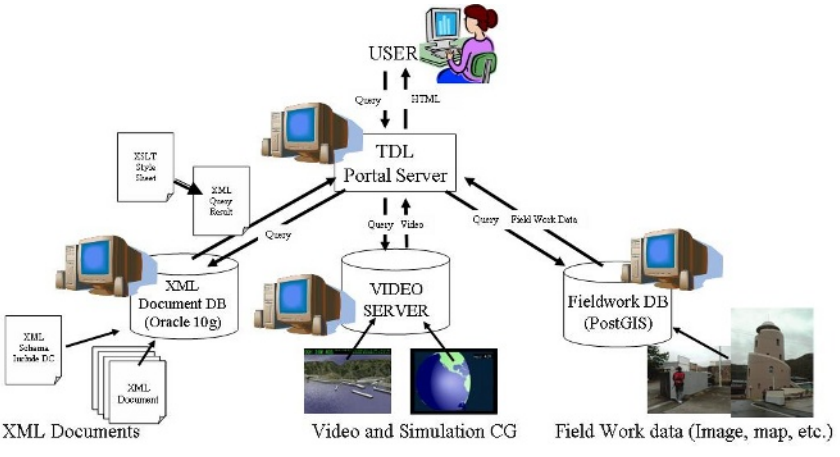


**Fig. 1.** Outline of the Tsunami Digital Library system

### 2.2 Contents of Tsunami Digital Library

We collected a various types of data about the Tsunami disaster, such as video, Tsunami run-up simulations (CG) and field work data which were captured by researchers at the Tsunami damage areas. The current TDL contents are follows:

- Reports about the Tsunami by governmental offices or researchers.
  - Four reports for countermeasures against the Tsunami.
  - Eleven reports for the Meiji era earthquake (the Meiji Great Sanriku Tsunami in 1896)

- Twenty-two reports for the Showa era earthquake (the Showa Sanriku Tsunami in 1933, the Showa Tonankai Tsunami in 1944, the Showa Nankai Tsunami in 1946 and the Chilean Tsunami in 1960).

- Six papers about damage of the Tsunami, its mechanism, etc.
- Four experience stories about the Tsunami (the Showa Tonankai Tsunami in 1948).
- Newspapers (articles about the Tsunami).

- Six newspapers published from June 17 to July 14, 1896.
- Eight newspapers published from Mar. 3 to Apr. 30, 1933, from Dec. 7, 1944 to Jan. 31, 1945, and from Dec. 21, 1948 to Feb. 28, 1949.

- Tsunami Run-up Simulations (CG).

- Ten run-up simulations about the Meiji Great Sanriku Tsunami.
- One run-up simulation about the Kanto Earthquake Tsunami in 1923.
- One run-up simulation about the Chilean Tsunami.

- Videos about struck scene by the Tsunami.

- Eight videos about the Chilean Tsunami in 1960, the Tokachioki Earthquake Tsunami in 1968 and the Nihonkai Chubu Earthquake Tsunami in 1983.

### 2.3 Data Structure of Tsunami XML Documents

In order to show the Tsunami documents effectively, we designed XML Database Schema and XSLT style sheet for the user interface. Fig 2 shows the XML Schema structure of Tsunami XML documents. The Tsunami documents are categorized by types of documents for example newspapers, papers, reports and miscellaneous documents. Fig 2 shows report document of the Tsunami. The root tag is <report> and the document tree consists of <metadata> that represents properties of document and <section> sub tree that represents body of the document. Fig 3 shows an example of XML document data. Fig 4 shows the XML document with XSLT style sheets. As shown in Fig. 4, for example, we can easily read articles according to a table of contents in a document.

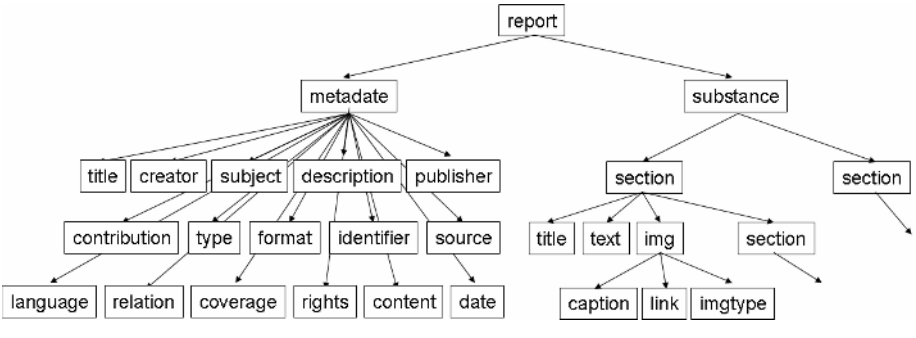


**Fig. 2.** XML Schema Structure

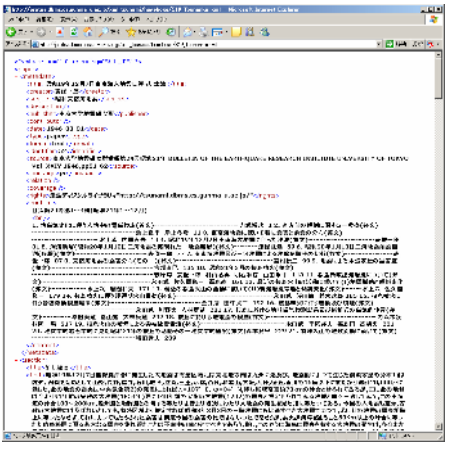

**Fig. 3.** XML Document

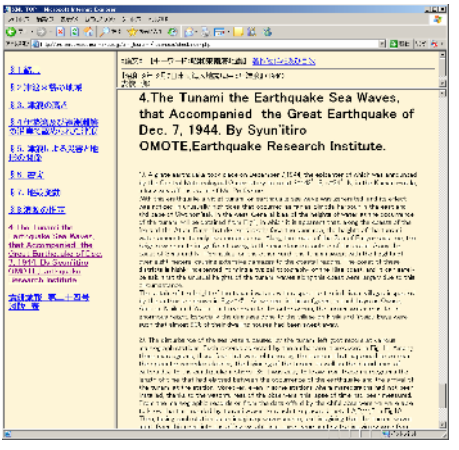


**Fig. 4.** XML Document with XSLT

## 3 Conclusion

We have developed the Tsunami Digital Library (TDL) as one of useful applications of the digital library. TDL is constructed by using database systems such as Oracle10g and PostGIS. By using TDL, many people who want information about the Tsunami can get various types of the Tsunami data such as reports, papers, countermeasure documents, newspapers, simulation video and so on. As one of TDL applications we are developing a text book to enlighten the Tsunami disaster based on the contents in the TDL.

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## References

1. Tsunami Digital Library: http://tsunami.dbms.cs.gunma-u.ac.jp