Development of Multimedia-GIS Application

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1 Introduction

With increasing availability of spatial data, there is an urgent need to develop way and means for providing easy accessibility and promote spatial data sharing. A wide range commercial software packages for spatial data sharing are now readily available. However, Free and Open Source Software (FOSS) tools not only provide a far more economical alternative but also more amenable to easy customization and maintenance. The spatial database system for management of landslides information (SLIDELinks) has been accomplished by using FOSS tools [1]. This system is Online GIS, a spatial data management is carried out using the GRASS GIS. The FOSS based Online GIS systems have limited compatibly and do not comply with widely accepted data exchange standards. In the case of distributed GIS, compatibly and compliance to widely accepted standards are necessary. It is satisfied these requirements by Web Map Server (WMS).
In this paper, we present some example of online spatial data system implemented using WMS and GRASS GIS of FOSS. This system offers a low-cost alternative to generating multimedia digital contents. Further, we describe the hardware, software, software components used in the system and also highlight its salient features.

2 About the system

The system was improved on previous multimedia workstation [2][3]. The system was implemented on a Linux platform (Mandrake Linux 10.0) using a kernel with modular supports Bt848/849/878/879 based frame grabbers (Linux bttv driver), some specialized hardware for audio-video input. The specialized hardware consists of analog video capture card, IEEE 1394 interface card for digital video input and a sound card. The video capture card used has an in-built television turner, so TV broadcast can be recorded directly. Analog video input is provided by a general purpose video deck that supports NSTC, PAL and SECAM video formats. Digital video and still picture input can be made using IEEE 1394 or USB connection cable. Sound input through audio storage media such as CD and tapes. Live sound input is provided through a mike unit. The detailed specification of the hardware and software applications is listed in Table 1.
The system offers a complete suite of multimedia tools for development of professional quality audio-visual contents. XawTV let real-time, non-liner audio and video capturing on Linux platform. The screen-shot in Fig.1 is showing that it is capturing from video using the XawTV. We have also tried using Linux Video Studio and LiVES, a simple application to make the capturing and editing video. And, we used MJPEG Tools to convert a capture file to various format file. Further, MJPEG Tools is a suite of programs which support video capture, basic editing, playback, and compression to MPEG-1/2 of MJPEG video. These video capture and edit tool are FOSS packages. The main features of the system are listed below.

Hardware & Driver	
CPU	Intel Pentium III, 933MHz
OS	Mandrake Linux 10.0
Kernel	2.6.3
Bttv driver	0.7.60
Capture card	IO-DATA GV-BCTV3/PCI
IEEE-1394 (Firewire) card	Orange Micro
Video deck	SONY SLV-R5
Sound Card	Sound Blaster Audigy 2
Software	
Video capture/TV viewer	XawTV
Video capture/edit/ convert	Linux Video Studio LiVES MJPEG Tools

Table 1: Hardware and software specifications.

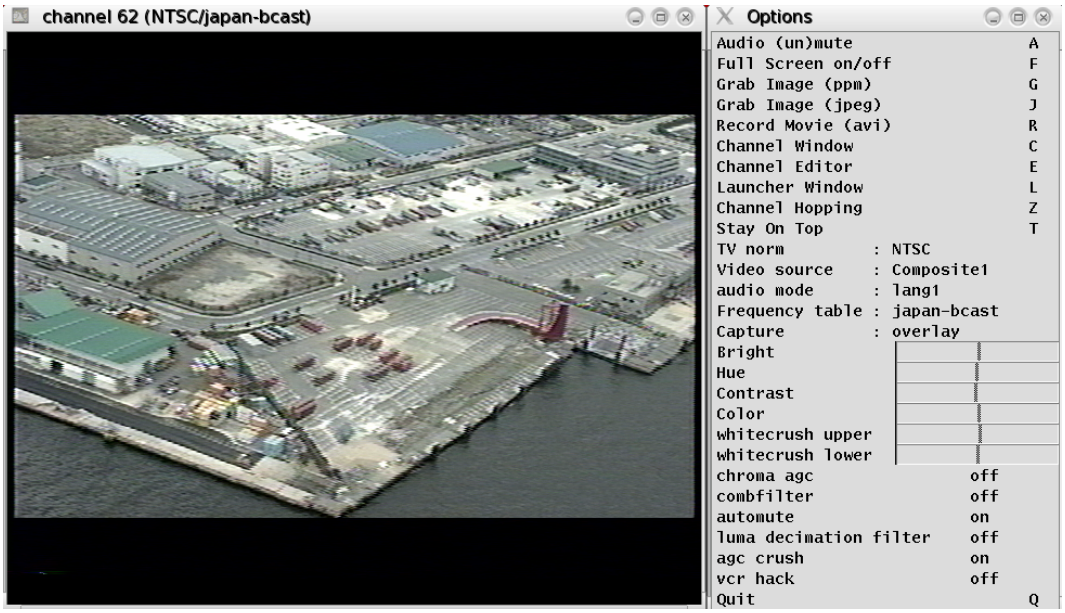

Figure 1: Screen-shot showing the XawTV, capturing the liquefaction area from video.

Video capture and DV-capture allows to import easily video from analog and digital sources. Video Capture works with popular capture hardware and DV-capture with most IEEE 1394 (FireWire) card or port. Video editor makes it easy to convert between different file formats and alter the timing of any video clip. For example, it can be used to optimize animated GIF graphics by removing unnecessary frames. Video sequencer is a powerful, multi-track editing program that lets combination of footage with transitions, effects, 2D and 3D titles. It includes a browser that enables you to import media and apply effects by dragging and dropping.

3 Features of Multimedia-Gis application

We implemented a prototype multimedia-gis application (Fig.2) using Minnesota MapServer (hereafter referred to as Mapserver: http://mapserver.gis.umn.edu/). It is an application of field survey report on disaster area of the 1995 HYOGOKEN-NANBU EARTHQUAKE, Japan. This application was developed by MapLab is a web-based Rapid Application Development (RAD) for easy prototyping and publishing of geo-spatial data.

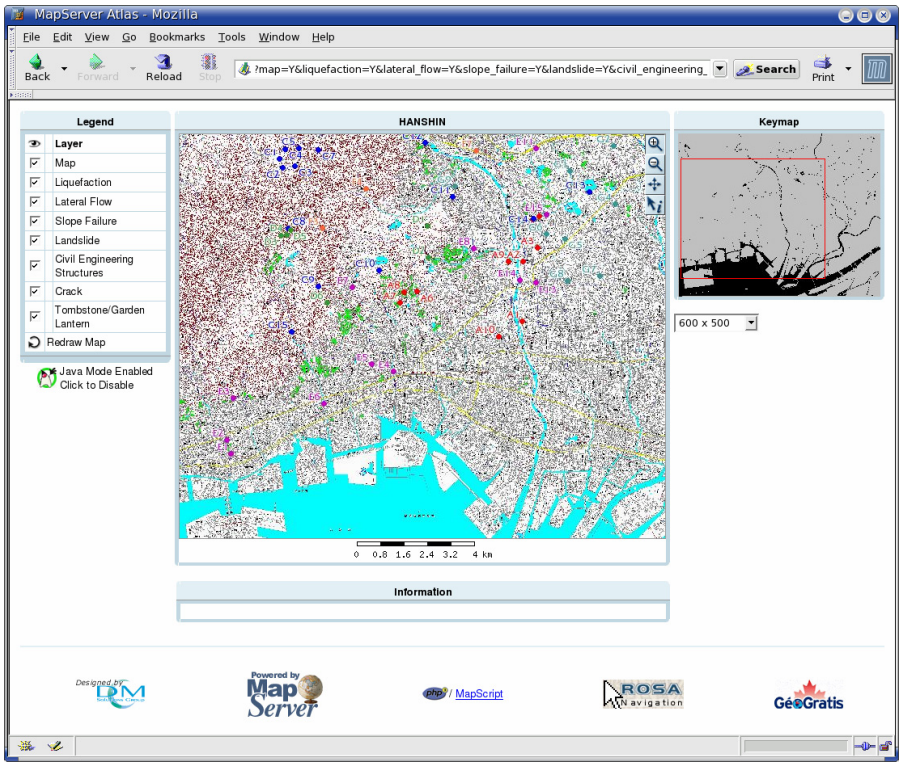

Figure 2: A prototype multimedia-gis application.

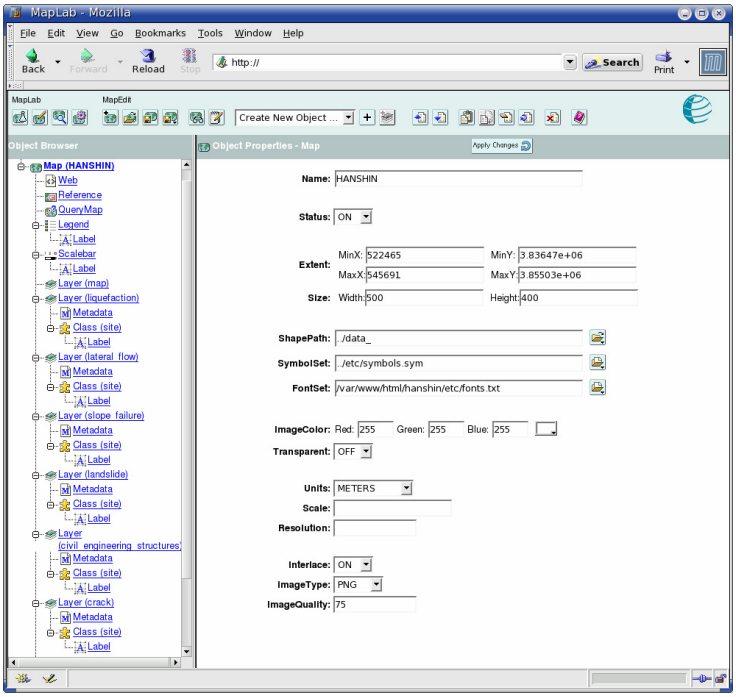

Figure 3: A prototype multimedia-gis application.

The MapLab allows the user to create, edit and manage the MapFile using the MapEdit application (Fig.3). MapFile is the basic configuration mechanism for the Mapserver, defines the output map. It is generated by GRASS GIS using the digital map (Scale 1:25.000; Geographical Survey Institute of Japan). The site data is expressed by adding new layer objects to existing MapFile. Layer data is shape file (*.shp), generated by GRASS GIS. The site data of this application as a type of damage are shown in Table 2. Their information is shown as multimedia data (Fig.4). It is included picture file (e.g.

ID	Layer data	Number of data
A	Liquefaction	10
B	Lateral flow	4
C	Slope failure	15
D	Landslide	7
E	Civil engineering structures	15
F	Crack	7
G	Tombstone garden / Lantern	10

Table 2: Type and Number of information data.

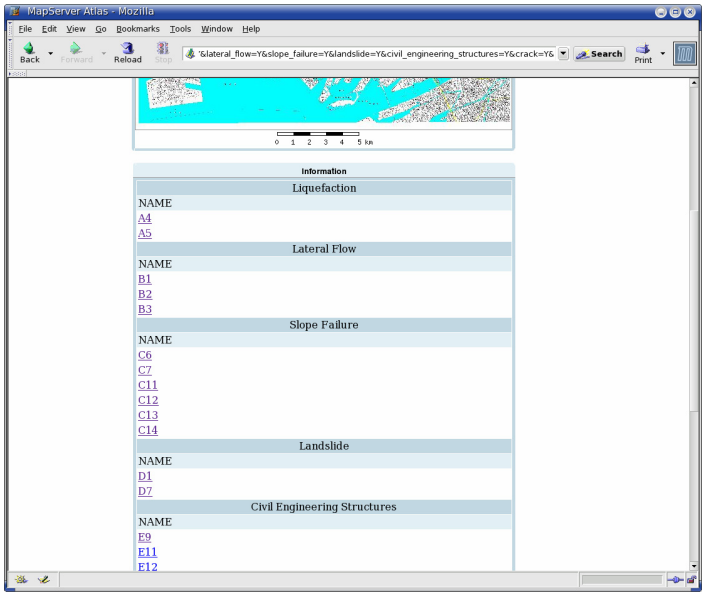

Figure 4: The site data information.

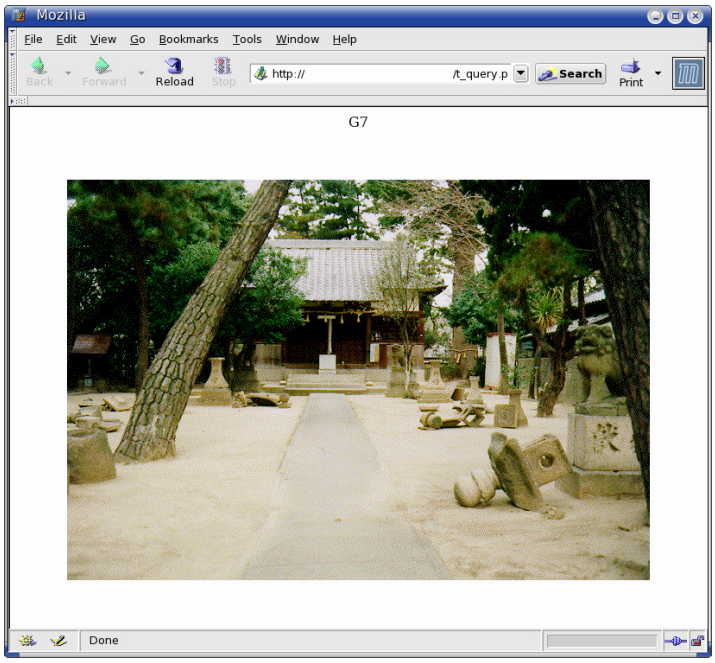

Figure 5: Example of Tombstone garden / Lantern information (JPEG file).

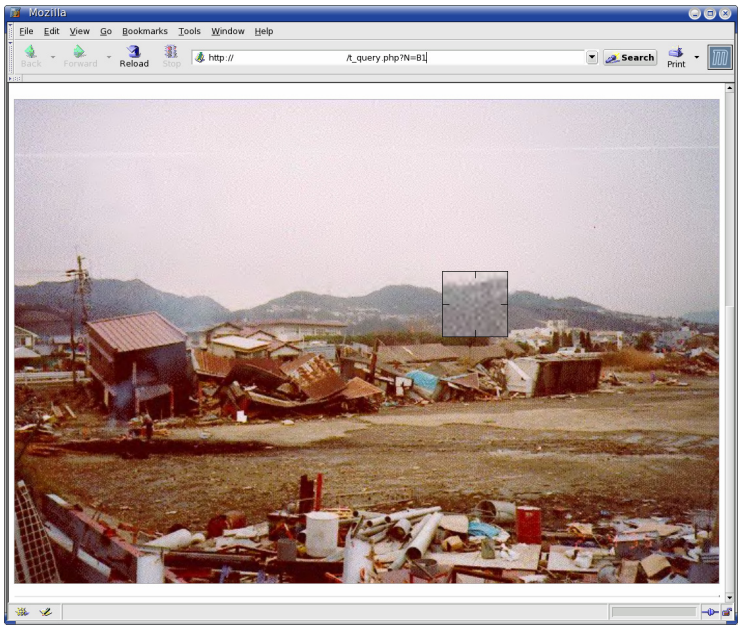

Figure 6: Example of Lateral flow (DJVU file).

JPEG, PNG), motion picture (e.g. MPEG), 3D Virtual Reality Models (e.g. VRML) and compressed image format (e.g. DJVU) files. It is linked to shape file layers. Showing the screenshot of tombstone garden and lantern data is JPEG file in Fig.5, lateral flow data is DJVU file in Fig.6.

5 Conclusion

The multimedia-gis application system described in this paper affords easy and rapid collection of multimedia information. Further, it is possible to make easily site data using GRASS GIS. This application is a web based field survey report on disaster area. The system could also be useful as a means for standardized collection of information pertaining to damage attributes. Such efforts will help coordinate better strategies for hazard prediction and mitigation. The system described in this paper could also serve as a model for developing multimedia system for other applications.

References

[1] Raghavan V., Yonezawa G., Nemoto T., Masumoto S., Fukuoka H., Noumi Y., Fujita T. Development of SLIDELinks - A Prototype Landslide Database. *Geoinformatics*, 11, 2, pages 112-113. 2000.

[2] Raghavan V., Kajiyama A., Yonezawa G., Masumoto S., Shibayama M. Implementation of Multimedia Workstation Using Open Source Software. *Geoinformatics*, 12, 2, pages 110-111. 2001.

[3] Kajiyama A., Raghavan V., Shibayama M., Masumoto S., Yonezawa G. Developing Multimedia Contents Using Open Source Software. *Bulletin of Osaka City University Media Center*, 3, pages 51-55. 2002.