

A WEB APPLICATION WITH VISUAL SAR PROCESSOR FOR EDUCATION

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1. INTRODUCTION

Recently, active remote sensing technique using synthetic aperture radar (SAR) has become popular. A number of lectures and seminars have focused on educating others of the advantages of SAR images. At these lectures and seminars, only focused SAR images were provided and investigated to avoid the complex SAR focusing technique required in most practices. Understanding the SAR technology is necessary to develop new approaches employing SAR data with various sensing modes. SAR training processors for a personal computer (PC) or Linux-based system have been introduced by several universities and communities over the Internet so far[1, 2]. These software did not have a visual interface from a view point of educational consideration enough. The computing capability necessary to process the SAR data often exceed the limitations of standard PCs in an educational environment. In this paper, a web application with a visual SAR processor using Ajax technology is proposed in consideration of educational use[3].

2. VISUAL SAR PROCESSOR FOR EDUCATION

2.1. Concept

In general, advanced expertise in information processing is necessary to process SAR data. For this reason, it is difficult for a beginner of remote sensing to study the SAR technology. In this study, learners are assumed to have little expertise in advanced mathematics and signal processing. To enable these users to work with the data on a standard educational PC, it is necessary to develop special treated software which can process the SAR data intuitively. The software must take into consideration the following requirements: (1) Intermediate complex data generated by processing the SAR data must be displayed as a set of color images. (2) User-friendly GUI and intuitive operation methods are key functions. (3) A simple operation that allows the user to understand the procedure at a glance is necessary. (4) Complex file management is implicitly processed in a server computer. (5) Appropriate parameters are automatically provided each time data is processed[4].

2.2. System structure

Fig. 1 indicates a system structure of the visual SAR processor for education (EduSAR)[5]. EduSAR has three software components: the SAR server, the HTTP server, and the web browser in each client computer. The HTTP server and the web browser work together under the Ajax technology. The SAR server is a main component for managing the SAR database and for processing all of the SAR data sets. The SAR server has a data manager, a SAR processor, and an image displaying manager. The SAR database contains processing parameters, all of the raw, intermediate, and final data. EduSAR has complex data layers to deal with multi-temporal, frequency, interferometric and polarimetric SAR data sets, which facilitate interpretation by the learner. The processed

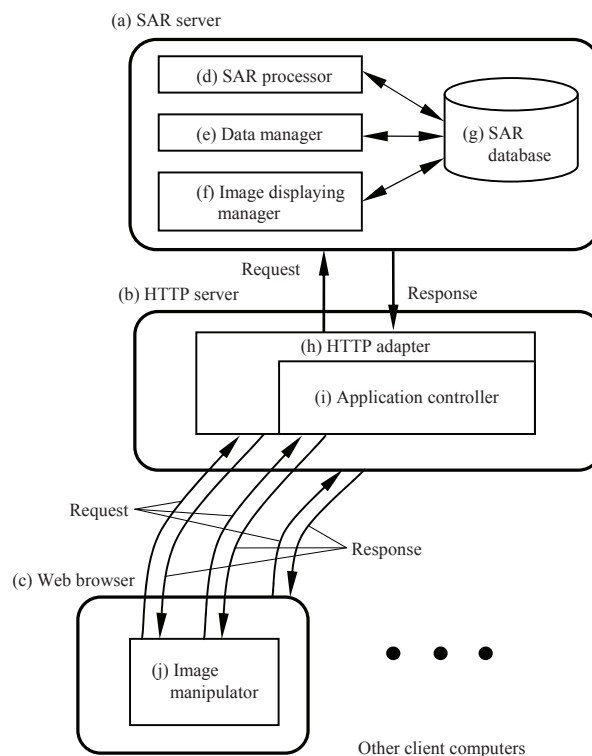


Figure 1. System structure of proposed web application with visual SAR processor.

data can be shown using more intuitive and interactive methods by the image displaying manager and the image manipulator.

3. PROCESSING EXAMPLE

At first, a catalog list of the SAR data is shown. The quick-look image is displayed by clicking the thumbnail icon in the catalog list. The main window consists of view area, scene selection tab, tool panel, vertical and horizontal scroll bars as shown in Fig. 1 (a). The learner can process the SAR data using the tool panel with various icons and indicators in Fig. 1 (b).

The cropped raw SAR data is displayed as a image converted from the integer complex data. The learner can visually recognize what the SAR sensor obtains from the ground by confirming locations and intensity of overlapped zone plates. After the range compression, the numerous vertical lines and the invalid region may be identified. Consequently, the azimuth compression is completed, a single- or multi-look image with slant range coordinates is shown. The azimuth compressed image with no blurring indicates that the SAR data is correctly focused. The learner can visually confirm the effect and locations of the invalid region in accordance with both range and azimuth compression processes.

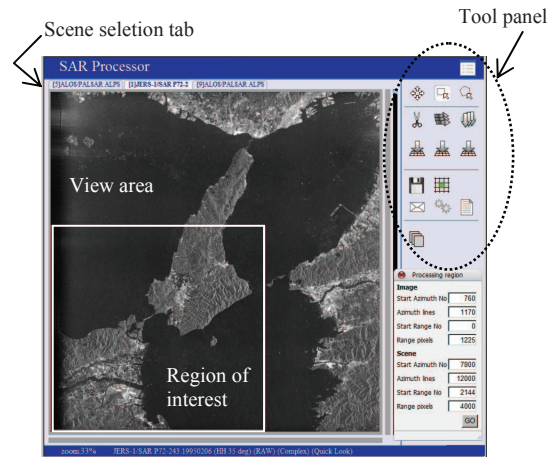
The map projection can be applied to all types of SAR images in the same way. In Fig. 2, the color image in the view area is composed of two ALOS PALSAR FBS (34.3 deg) images using ascending and descending orbits, and one JERS-1 SAR image using descending orbit. These are projected on the same UTM zone. As shown in this example, the ground change can be easily detected by overlaying two or more SAR images.

4. CONCLUSIONS

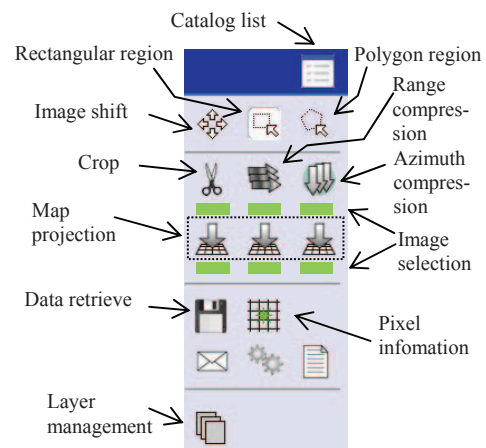
The visual SAR processor as a web application based on the educational concept has been presented with the system structure and the processing example. The developed web application will be more effective than current systems for furthering the instruction of SAR technology.

5. REFERENCES

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(a) Quick look image, region of interest as a rectangle and dialog of processing region.



(b) Operation and icons in the tool panel.

Figure. 1 Processing example and GUI of the visual SAR processor.

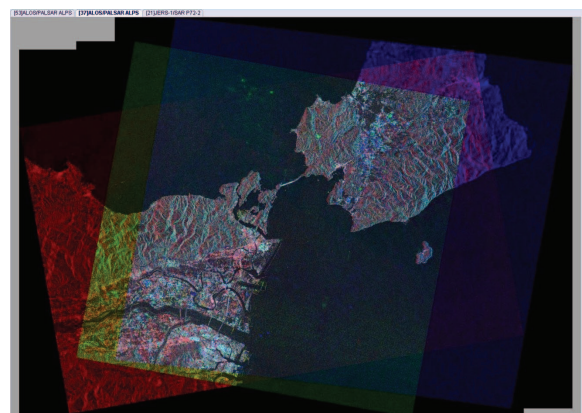


Figure. 2 An example of overlaying three map-projected SAR images. The area is Tokushima, Japan.