A Web-Based Run-Length Encoded Map Generating System

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Abstract: Maps are used to display information for educational and scientific purposes on a daily basis. The capability of generating web-based interactive maps by non-specialists and non-programmers is of great convenience. The map generating system described in this paper can handle any arbitrary map, including those with embedded and disjoined regions. The resulting web-based interactive maps can be used in many different applications requiring color-coded display of quantitative data.

1. Introduction

The Digital Flora of Texas (DFT) project has been actively pursuing the construction of biodiversity informatics tools for use by interested biologists, students, scholars and researchers. One of the browsing tools that has been used extensively is the Herbarium Specimen Browser (HSB), originally developed in 1996 and modified based on user feedback over the last five years. The HSB allows users to survey the content of collections from various herbaria throughout the state of Texas. It supports fast access and dynamic filtering of data on the fly. Information related to any combination of counties, herbaria and specimens can be displayed in real time by merely clicking on the interface shown in Figure 1.

The HSB also provides an interactive map that dynamically displays the density and distribution of herbarium specimens based upon user selections of plant families, genera, or species (Fig. 2). Clicking on a county displays the characteristics of the plant specimens that have been collected from the county by the selected herbaria. The HSB supports three mapping options: counties of the state of Texas; counties of the states of Texas, Oklahoma, Louisiana, New Mexico and Arkansas (shown); and, states/provinces of North America. Lastly, it allows users to query the collection using any combination of search terms such as name of herbaria, specimen accession number or country.

Of course, for this mapping system to work properly, someone must generate the map and associate commands that make it respond to users’ requests. In the original HSB, one had to obtain a map in PBM format, convert the map into Run-Length Encoding (RLE) format, and associate region names with the pixels in the image before the map could be used. The entire process was tedious and error prone.

The objective of this project was to simplify the process of generating a mapping system by providing a web-based automated tool that accepts some of the widely used graphics formats for the PC. In other words, given files in GIF, JPEG or BMP format, the system automatically generates the RLE file needed for the HSB or other run-length encoded mapping system. To remove the burden of manually associating region naming with the map regions, the system allows users to name map regions easily and generates the required files that allow the browser’s mapping system to recognize the regions being selected by the user.
A verifier is also provided that allows users to check and correct errors in their naming schemes and serves as a prototype for interactive mapping routines.

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Figure 1: The interface of the Herbarium Specimen Browser

Figure 2: Distribution of specimens from counties in Texas, Oklahoma, Louisiana, New Mexico and Arkansas