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GeoCoastPilot

Better ways of organizing and displaying information in support of port familiarization

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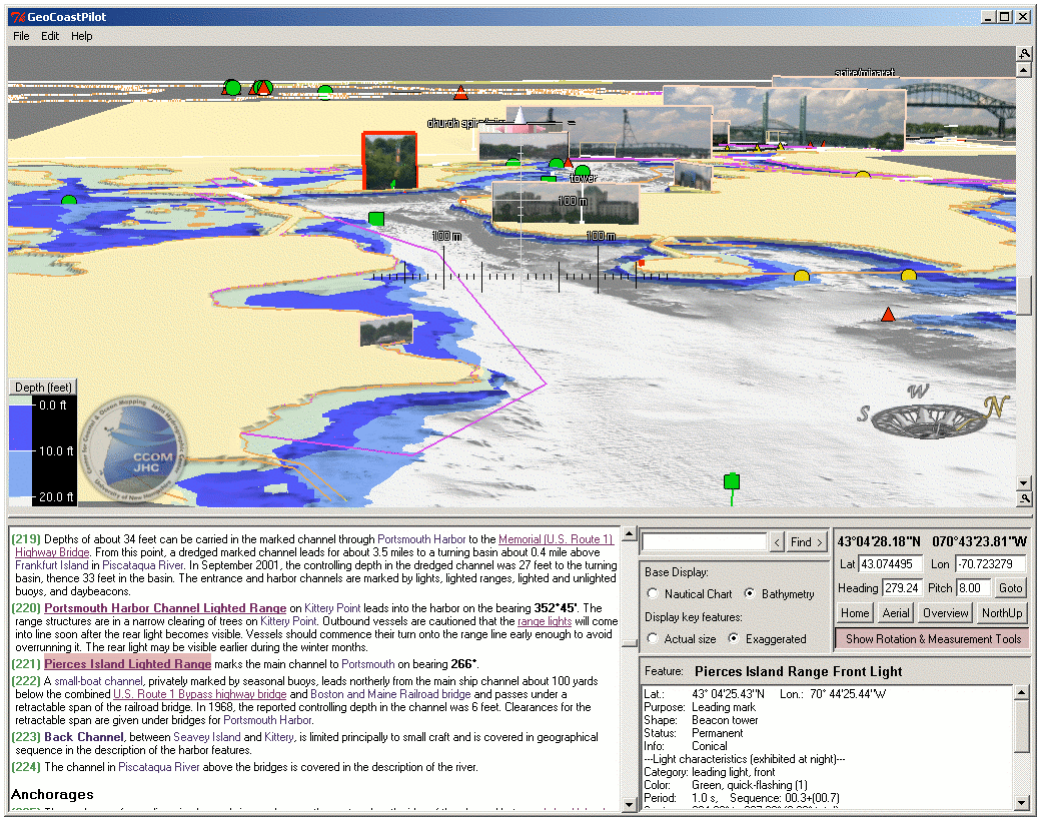
GeoCoastPilot is a research software application built to explore techniques for simplifying access to the navigation information a mariner needs prior to entering or leaving a port. GeoCoastPilot is not intended to be used directly for navigation purposes, but instead is intended to demonstrate what is possible with current technology and to facilitate technology transfer. We started with this question in mind, "What might a digital application based on the NOAA Coast Pilot look like if other marine data sources were combined with it?" GeoCoastPilot is intended primarily for operators of smaller vessels—those not under the Safety of Life at Sea (SOLAS) regulations.

GeoCoastPilot introduces two new capabilities to existing marine information products: mutliramas and hyperlinks. First, a multirama is a collection of photos of a landmark or a navigation aid taken from multiple vantage points. These mutliramas are situated inside a simplified 3D representation of a port. As a mariner explores the virtual port, only the image that best represents the object from the current virtual perspective is shown. Additionally, the size of an image is exaggerated according to its relevance to navigation, simulating what it might look like to set up binoculars focused on each important object. This visualization technique helps the mariner become familiar with the relative location of critical navigation-related features within a port before ever going there.



The second capability GeoCoastPilot introduces is hyperlinks between the NOAA Coast Pilot publication text, S-57 electronic navigational charts (ENC's), multiramas, and the U.S. Code of Federal Regulations

(CFR). When the mariner clicks on a photograph in the 3D scene, it highlights the first place in the Coast Pilot text that the related object appears, and also brings up associated ENC information such as lights and signals. Clicking on boldface text in the Coast Pilot area causes the perspective on the 3D scene to smoothly move until it is centered on the associated object, and also displays any related ENC information. When a CFR hyperlink is clicked, the full text of the specific federal regulations referenced in the Coast Pilot text is displayed. Further, GeoCoastPilot includes hyperlinks to other information resources that can be browsed on the web if the mariner is online.

In order to make these hyperlinks work, we developed a mostly-automated process of converting NOAA Coast Pilot chapters from PDF to XML marked up with salient metadata. This process inserts XML tags of key place names and government regulations from the CFR, as well as markup tags for formatting items like section names and paragraph numbers. The process includes a small amount of hand editing to resolve ambiguities inherent in English narrative. Similarly, we have added limited metadata tags to CFR text, and tagged our multirama photographs with XML metadata including object names, heading of the camera, and image size. Beyond making it possible to hyperlink data sources for GeoCoastPilot, having textual narrative in an XML format also makes it possible to present the information in different media-appropriate formats (e.g., print, web pages, and cell phones).

In order for commercial software applications to more easily adopt mutliramas and hyperlinking, we believe two paradigms for data collection and management should be observed. First, pertinent marine information sources should be thoroughly tagged with metadata. This means not just tagging items such as date of collection and quality, but also tagging unique names for all salient objects (e.g., places, features, and regulations) and using sufficiently robust names so as to support indexing and cross-referencing across information sources. This paradigm was partially achieved in standardization efforts such as S-57, but the current scope is limited primarily to charts and light lists. This paradigm is further illustrated in the manner XML was used to add metadata to selected portions of the NOAA Coast Pilot, the CFR, and collections of photographs.

The second paradigm for data collection and management involves publishing simple mappings of object and attribute names between different information sources. We believe that creating one overarching standard to regulate names across all data sources would be counterproductive. Instead, tables should be created and maintained to ensure interoperability between data sources. For example, in order to hyplerlink objects in GeoCoastPilot, we constructed simple tables to indicate which objects were the same across ENC data, the Coast Pilot, and multiramas. By relying on mappings of names between information sources, items that are the same across sources can be identified while organizations that maintain the information can continue to function independently. In addition, new data sources can be accommodated without impacting the existing information infrastructure. As long as each data source is internally consistent and a mapping between sources can be kept up-to-date, software applications can then more easily integrate the data in ways similar to GeoCoastPilot. This, in turn, can enable mariners to more easily access information prior to entering or leaving a port.

The operational benefits of GeoCoastPilot should result in:

- decreased time in searching for relevant information;
- fewer errors in interpreting the information;
- increased awareness of important navigation aids, hazards, and regulations;
- and better accuracy and timeliness of information due to more effective mariner participation in reporting errors and field updates.

The GeoCoastPilot research application currently covers Portsmouth Harbor and can be downloaded from http://ccom.unh.edu/GeoCoastPilot.