Mammoth Site Interactive Map Kiosk Software

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Abstract

The Mammoth Site in Hot Springs, South Dakota is a museum and research facility that hosts a large indoor dig site containing fossil remains of over fifty Columbian Mammoths, as well as many other prehistoric animals. Employees offer thirty minute guided tours at the site. However, with thousands of fossils on site, getting information to the public about every bone and species in the site is impossible within this time frame.

This project aims to make a computerized bone bed map, featuring every bone within the facility, to the public. The Mammoth Site currently uses a complicated geological program called ArcGIS 9.3 to produce a detailed map and database of everything in the bone bed. We aim to output their database to a kiosk computer that would be much more user friendly. This map would allow a user to pan through the entire map, zoom in and out, and choose to view bones based on specified criteria. A user would also be able to select any bone in the map by touching it on screen and calling up that bone's database entry, providing the visitor with information on the type of bone, the animal it came from, its condition, and who discovered it.

1.0 Background

The Mammoth Site in Hot Springs, South Dakota is a museum and research facility that hosts a large indoor dig site containing fossil remains of over fifty Columbian Mammoths, as well as many other prehistoric species. The Mammoth Site has many purposes, focused heavily on education. Their website states their purpose as follows:

> **Purpose**
> 1 To investigate and interpret this unique late Pleistocene (Ice Age) natural death trap for mammoths and related fauna and flora.
> 2 To protect the scientific integrity of the Site through the preservation and collection management of fossils and other geological materials.
> 3 To serve as a world-class center specializing in mammoth research.
> 4 To provide comprehensive educational programming based on the science of the Site and surrounding natural history.
> 5 To foster cooperative efforts in research and education worldwide. "

Employees offer thirty minute guided tours at the site. However, with over fifteen hundred fossils on site, getting information to the public about every bone and species is impossible within this time frame.

2.0 Client Requirements

The Mammoth Site has requested a digital bone bed map to be placed on a kiosk at their facility. The map would be a small scale version of the entire site. This map would allow visitors to locate and examine any bone in the dig site.

Currently, the Mammoth Site researchers uses a similar map to keep track of everything that is in the site using a program called ArcGIS 9.3. ArcGIS is a geographic information system allowing interpretation of data using maps. However, this software is highly complicated and impractical for the every day user, so we have been asked to make a simpler version that any visitor can pick up and use with ease.
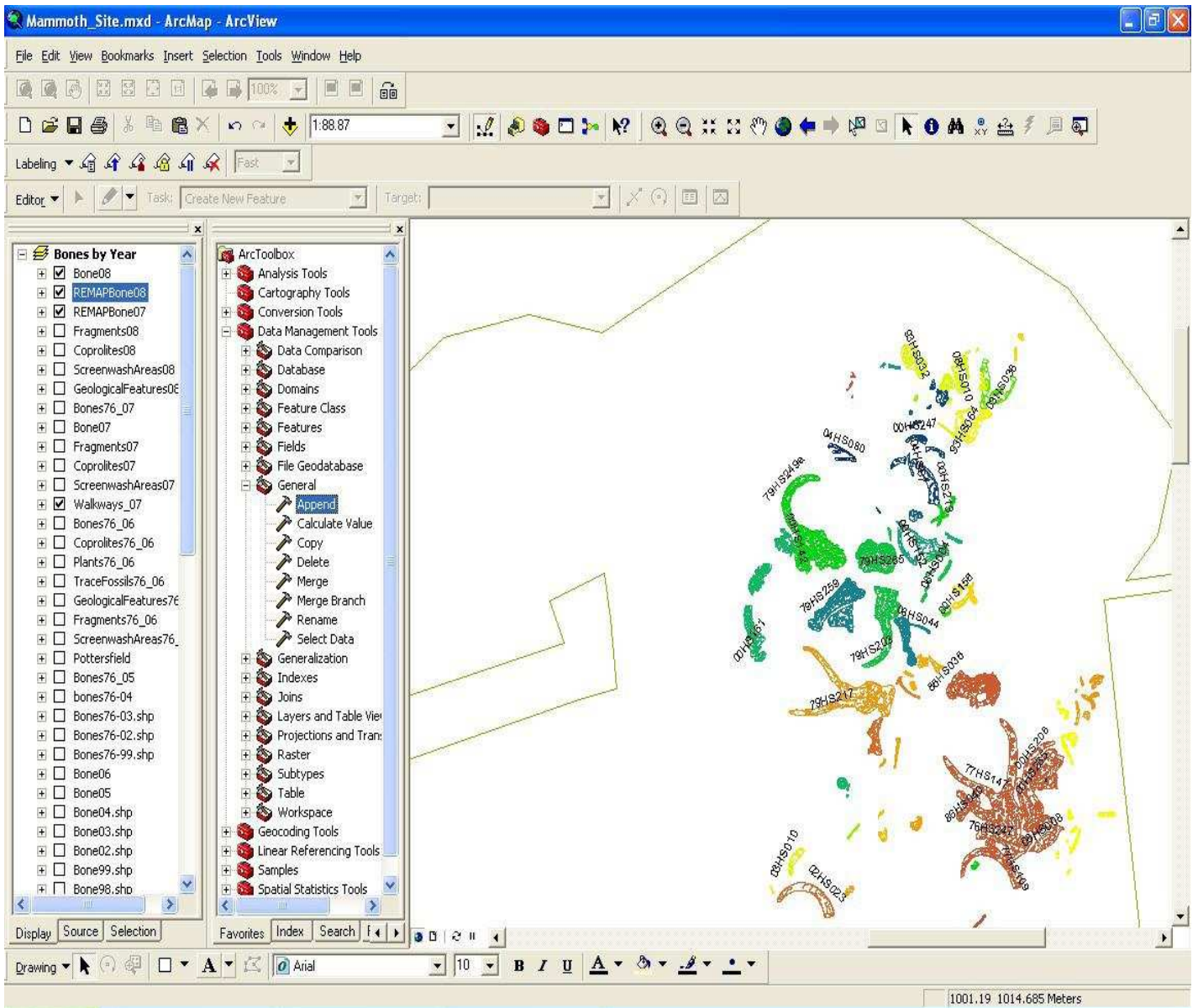
Figure 2.1.1 ArcGIS 9.3 Software

The requested map will feature a zoom tool, a pan tool, and a detail slider that will control how much information is displayed on the screen based on the Mammoth Site's rankings of each bone. The map should also feature a search tool. Using the search tool will cause the bones on the map meeting a certain criteria to become highlighted. When a specific bone is chosen, there should be an option to highlight bones that are considered similiar.

Finally, the site has requested that the map be easy for the employees to update. The site hosts an annual dig in the summer, and the map needs to be updated when new specimens are found

3.0 Architecture
The main component of the design is the kiosk system itself. Two types of users will need to access the kiosk system. The first, a typical visitor, will access the kiosk in order to view the map of the site. The

second user will be an employee or system administrator at the Mammoth Site. This user will be accessing the kiosk in order to update the map and add new specimens.

Each user will access the system in a unique way. The typical visitor will interact with the graphical user interface on the touch screen of the kiosk screen itself, while the employee will be accessing a database that then communicates with the software. The design concept is shown below:
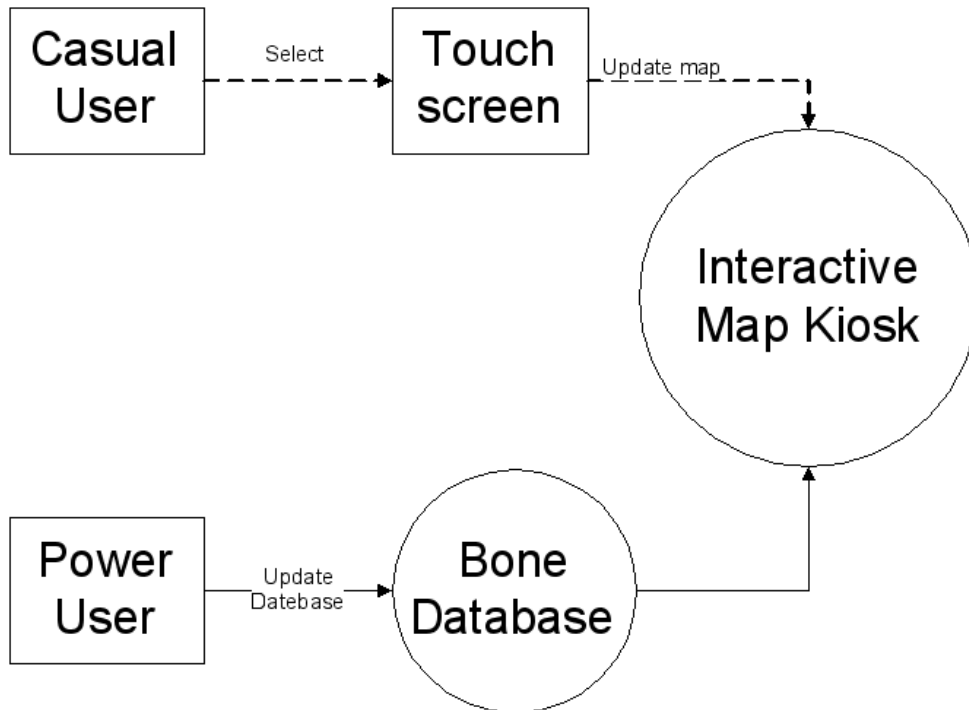

Figure 3.1.1 – Context Diagram

3.1 Language Choice
This project is being developed in the Java language. The reason for this choice was an emphasis on cross platform compatibility and portability. The group developing the design will not be available for any maintenance or updates, so we have chosen to write in a language that is easy to port on the chance that the Mammoth Site decides to change or update any of their hardware in the future. Because of the choice in language, we expect the Java runtime environment to be installed on the system running the software.

3.2 Graphical User Interface
The graphical user interface of the kiosk system is one of the most important aspects of the software. It is the only thing the average user sees when using the software, and so it must be both inviting and functional. The team developed two prototypes for the software with which to base the final design off of. These can be seen below:
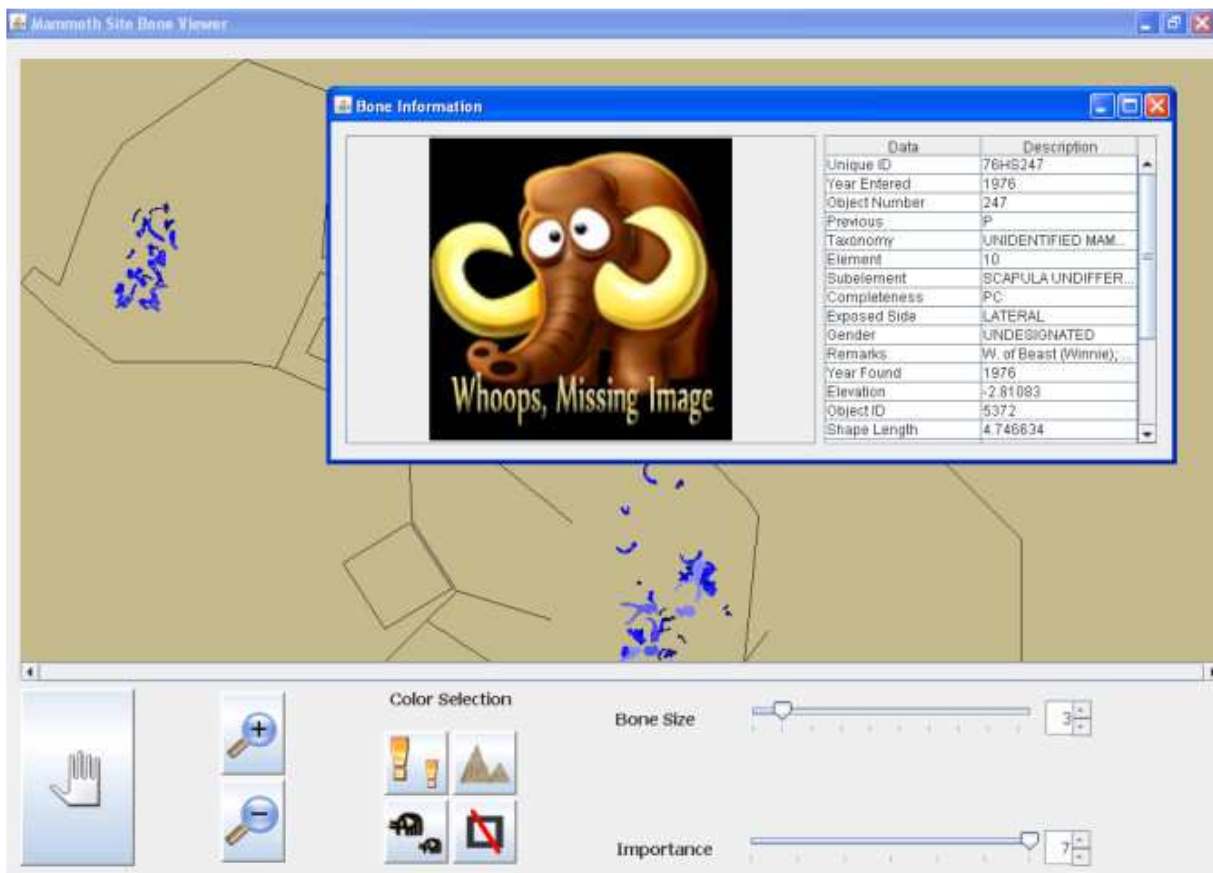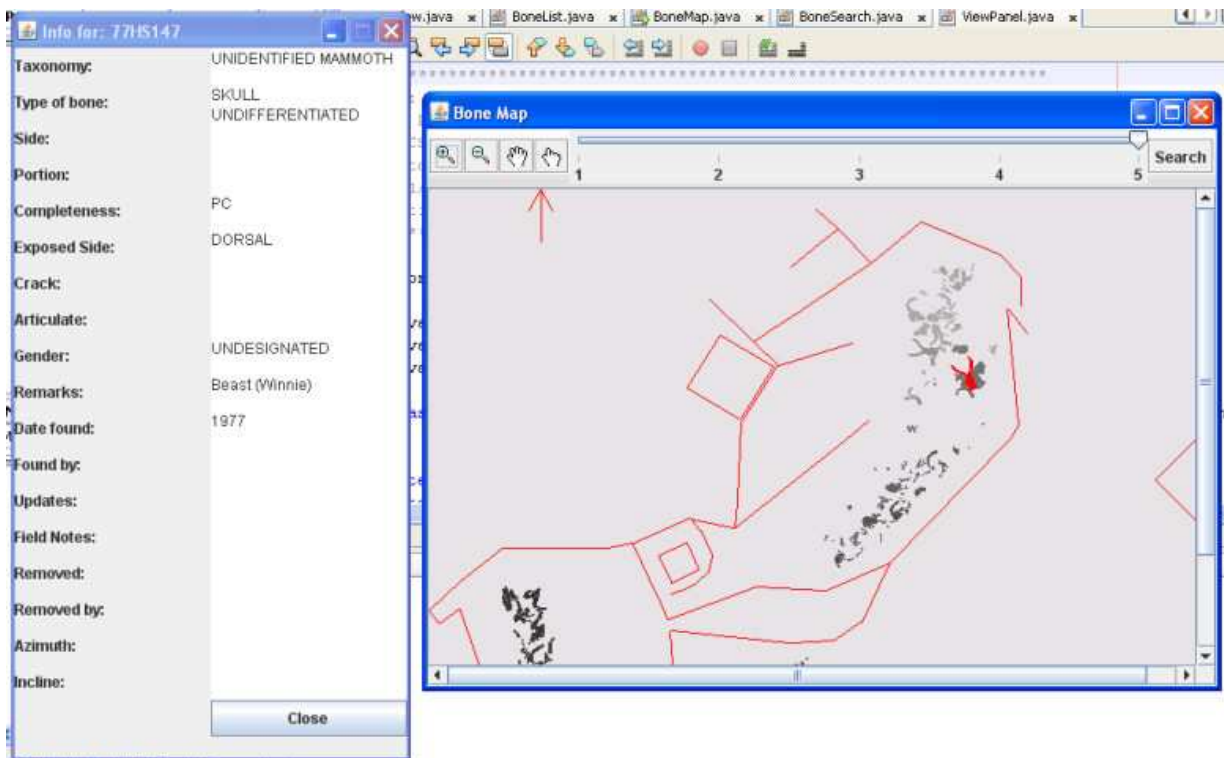
Figure 3.3.1 Prototype 1

Figure 3.3.2 Prototype 2

3.3 Database

The Database the mammoth site currently has is the ArcGIS database with all the bones and bone information inside of it. Instead of developing a program that would run concurrently off this database and could potentially have runtime overhead with all the extra information that's in the database, the team decided to just have an ArcGIS to XML conversion script for the Mammoth Site to run whenever there is new information. This process would only have to happen 3 months out of the year since they only do digging when volunteers can come, which only happens a couple of months out of the year. An additional benefit of this is that the kiosk software doesn't have to have extra modules to worry about running on an internal network to find the database, all the information it would need would be stored in XML files in the program directory.

4.0 What you've done

The majority of the work on the project is completed, as each module we explained earlier has been written and tested individually to work properly. To give a list of what's actually done it would be as follows:

- The bonebed is being displayed properly from the XML files
- The bonebed is displaying the bones in real time with no visible lag
- The bones can be sorted out via an importance slider
- The bones can be sorted out via their sex
- The bones can be clicked on and view their particular information
- The map can be zoomed in and out
- The map can be panned
- The bones can be searched for via a custom search menu(user input)

One of the only things left for the team to accomplish, and arguably one of the most important tasks overall, is to put all these modules together and to make them as graphically appealing as possible. As seen on the prototype images, most things work together well, the team just needs to finalize a more graphically appealing version of it, making it something that the visitor would be compelled to try out.

Besides making it more appealing, the only other task for the team is to change the ArcGIS to XML converter to allow for pictures that the Mammoth Site just recently acquired for the team's use.

5.0 How Successful

The team believes that what they've done has followed the Mammoth Site's requests, and in doing so are very successful so far. The prototypes load in under 5 seconds and display everything in real time without lag, so that seems to show what's being worked on is very efficient and successful. The only things that are somewhat erroneous in the running of the prototypes is that when selecting importance level 1(being the most important bones) it shows fairly unimportant ones, but that can be chalked up to the fact that not all the bones have these importance levels, and the Mammoth Site said they would work on completing the records for that, as well as other categories that aren't quite fully filled out. After all, the database of bones they have wasn't filled in with the general public in mind, but with the researchers in mind, so some areas stayed blank.

5.1 Conclusion

The last test to come, as alluded to earlier, is to put all the pieces together into something an average user would be naturally drawn to. This is the real test in the team's eye, but it appears there are some already promising results, and only better results just over the horizon.

Resources

GIS and Mapping Software, http://www.esri.com, 2009.

Mammoth Site, http://www.mammothsite.com , 2009.