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CS 498 Social Visualizations
Final Project

Introduction
I was in Uganda from March 21 – 30th, 2009. During my visit, I noticed the widespread effect HIV/AIDS had on local communities. I realized that the disease does not only affect those infected, but it affects everyone in the community. I want to create a visualization that helps people in our campus understand this point. After deciding to visualize HIV/AIDS, a large preventable disease, I thought it would be interesting to visualize the second and third largest preventable diseases that plague Africa – Malaria and Tuberculosis. My final idea was to visualize the mortality rate in each African country due to the these three preventable diseases.

Motivation
I created this visualization to draw attention to three preventable diseases in the African Continent. The point that should be stressed is that these diseases are preventable. People should be aware of the extremely high mortality rates due to these three preventable diseases. The ultimate goal is to start a chain reaction of action in pursuit of finding a solution to prevent these diseases in the continent.

Usability
This simulation of mortality rates due to three preventable diseases in African countries will help people study/understand which countries are most affected by which diseases. From this, the audience of the visualization are people who are studying/interested in learning about preventable diseases in African countries. After watching this visualization for awhile, one begins to recognize patterns. You begin to recognize that certain countries are constantly affected (the mortality rate is high) by a specific disease. You can also tell what specific disease affects the a specific country the most and the least. The simulation raises moral and political questions. Why are so many people dying in these specific countries? Why aren't the local government or international governments doing anything about this? These diseases are preventable, what steps can we take to prevent these people from dying?
Furthermore, I have included a legend at the bottom left of the Africa Map to help users understand the simulation. With this added feature, I feel the simulation is very easy to understand.

Engineering
This simulation was developed in Python 2.6.1. It makes use of Python's Imaging Library, and an Image_display script. It is backed up by data from the World Health Organization (apps.who.int/whosis/data/Search.jsp) that provided the number of people who have died in a specific country from a specific disease out of 100,000 people every year. Most of the data from the WHO was dated 2005, with a few exceptions dated 2002. These exceptions are figures from the Cape Verde, Ethiopia, Liberia and Sao Tome and Principe. Furthermore, I got the population for each country in Africa from (nationmaster.com). Then, I divided the population for each country by 100,000. This gave me the number of segments of 100,000 people in a country. To calculate the total number of people who die from a specific disease in a specific country every year, I multiplied the original numbers provided by the WHO with the number I just calculated. (To further understand this process, I recommend opening the file named “resultsedited.csv” attached with the final paper) From these numbers, I was able to derive the probability that someone would die from a specific disease in a specific country every year. These probability numbers along with the help of a function in Python that assigns these probabilities, I was able to designate the chances of specific disease occurring in a specific country at an average rate. I calculated this rate by converting the deaths in each country every year to deaths in each country every second. After finding the figures in seconds, I found the average rate at which someone dies in the African continent from a specific disease every second. These rates are 12 minutes for one death by HIV/AIDS, 27 minutes for one death by Malaria, and 59 minutes for one death by Tuberculosis.
If possible, I would like to add a counter that can keep track of how many deaths have occurred due to a specific disease all over Africa while the viewer has been watching. Furthermore, it would be beneficial to be able to mouse-over a specific country and view the statistics in real time of deaths by specific diseases.
This simulation does claim to be, nor is completely accurate. It is based on probabilities. Furthermore, it is also based on the data provided by the W.H.O. Which may not be completely accurate as well. However, it does give you a decent approximation to the realities on the ground in each country. Therefore, the bottleneck is making sure that the simulation is able to simulate deaths as accurately as possible. The system I am currently using determines where to place the circle by using probabilities for the whole continent. As explained above, I have aggregated the information to explain deaths from a specific disease in the entire continent. The function I developed in Python uses this continent wide information to assign which country show which disease. I have also found a rate of death by each disease for the whole continent before hand. It would be more exact to develop hundreds of functions that use country specific information to assign which part of the country should show which disease in a varied time frame. This would require a lot more research into each of the 45 countries in Africa, and a lot more time developing Python code. This is a suggestion for the future, that would make this project a lot better. Overall, I feel this simulation is educational and beneficial to understanding the affect of these diseases in African countries.

**Design**

The core of the design comes from the Africa Map that is the background of the simulation. This Africa Map was generated from Google Earth images. Furthermore, I tried to develop this background and add more stylistic features. The legend, located on the bottom left of the map, was designed in Adobe Photoshop CS4. I used the same colors found on the Africa Map to fill in and border the legend. Moreover, on the top right hand corner, I have included a title for the simulation, “Preventable Diseases killing Africa.” The color of this title is picked from the Africa Map as well to create a soothing color balance. The colors for the specific diseases were also carefully selected to represent natural, sober colors. Overall, I wanted to create an aesthetic balance between color and design.

**Process**

I developed a conceptual sketch of the simulation in my notebook before I started programming with Python. This sketch allowed me to identify the location of the capitals of each country. Through this sketch, I was able to codify the exact coordinates of the capitals on the Africa Map. Furthermore, it provided me with a physical vision of what I wanted my simulation to look like.

I went through many iterations of the code in Python. Every time I added a function, array, Photoshop element, I would reload the code and run the simulation. I have not saved any previous copies of my code as I kept saving over one file called “Preventable Disease killing Africa”. A major set-back in the development of this code, was the time the code would take to run on my computer. I was running Python 2.6.1 on my Macbook after I had installed Windows Vista. I did not allocate enough hard drive space to Vista, and therefore suffered extreme time delays when running processes that took up a significant amount of memory.

Overall, however, I thoroughly enjoyed the challenges and successes while using Python 2.6.1. I learned a lot about the programming language's abilities and limits. I decided to use this programming language after learning it in a course I am taking this semester, Informatics 103. I wanted to test out the material I had learned in the course to see if I could create a program on my own. I feel that I have been successful.

**Related Work**

I have not come across any simulation that does quite the same thing as the one I have created. My inspiration for this project was “Breathing Earth” (http://www.breathingearth.net/), a simulation of the world's population and carbon dioxide levels broken down by country. As mentioned before, my inspiration from my trip to Africa and viewing this simulation in class, made me come up with the idea for “Preventable Diseases killing Africa.” I feel that visualizations and simulations are great story tellers. They provide a method with low time and social costs to educate people about specific problems affecting our planet. I feel that my work is the first of its kind. I hope to see many more simulations addressing preventable disease problems in Africa and around the world.