Visualizing empires decline

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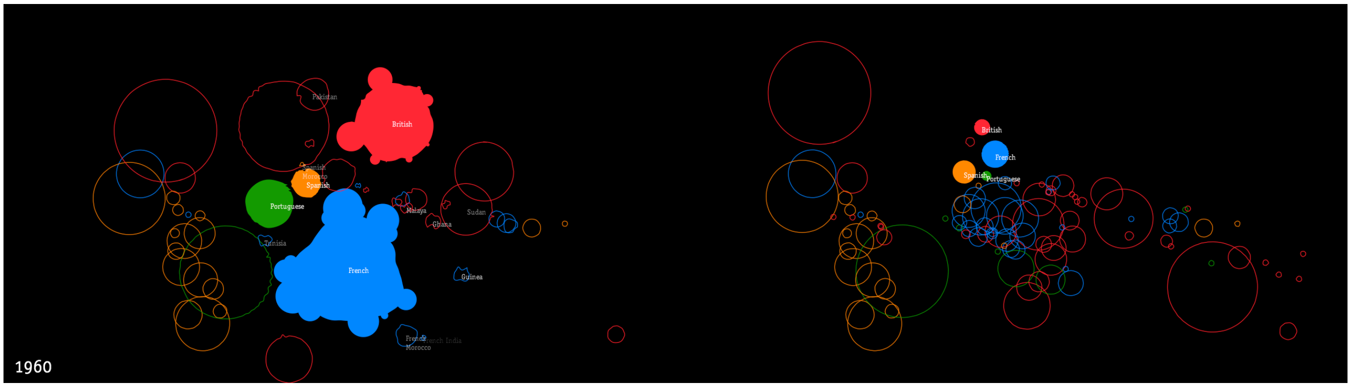

Figure 1 *The left side of the figure is a snapshot of the simulation in 1960 when most of the French colonies gain their independence. The right side of the figure represents the end of the simulation after 2000 and displays all the former colonies stabilized in their geographic locations.*

1 Introduction

This is an information visualization project that narrates the decline of the British, French, Portuguese and Spanish empires during the 19th and 20th centuries. These empires were the main maritime empires in terms of land area during the referred centuries [Wikipedia]. The land area of the empires and its former colonies is continuously represented in the simulation. The size of the empires varies during the simulation as they gain, or lose, territories. Soft bodies are employed to represent the volatility and dynamic nature of the empires.

The physics engine responsible by inter and self bodies interactions was implemented using springs, providing an aggressive behavior between fluid forms. These complex interactions between graphic representation forms are used to synthesize large quantities of data and extract significant conclusions. By these means, a simplified, compact and ludic narrative of the expansion and decline of these empires over a period of more than two centuries is obtained.

2 Implementation and behavior

For the representation of each empire is used a circle that looks and acts like a soft body. The area of each circle is directly proportional to the area of an empire. For each new independence a new soft body is created that persists in time and is attracted to its geographical position. The soft bodies behavior was implemented building a skeleton for each circle through particles connected with springs. The springs implementation is provided by 'toxiclibs' 2D physics engine [Schmidt], and provide Verlet integration that aims to be more stable than the classic Euler or the Runge-Kutta methods [Jakobsen]. Springs are also used to implement the forces that act in the simulation world, being able to present a behavior that includes collisions, attractions, repulsions, etc. For this purpose, all the particles in each body are evaluated against the particles of other bodies, and if their distance is inferior to a certain minimum, springs are temporary created to attain repulsions. If the particles come far enough, the springs are deleted. The outcome of this process in a non deterministic simulation, being able to exhibit different behaviors for the same data, but constituting the same narrative. Nevertheless, this non-deterministic nature can cause glitches in bodies' interactions.

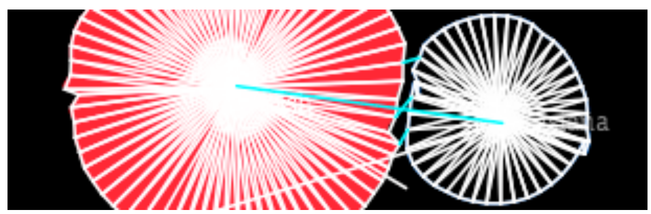

Figure 2 *Detail of the springs responsible for the system's behavior. The white lines represent the springs that form each body skeleton, as well as the per body geographic attractor. The temporary springs that implement bodies' collisions are represented in cyan.*

The simulation runs from 1770 to 2010, incrementing one year per second, but speeds out by three times if there are no independences in the near future, producing a video of 2 minutes and 56 seconds with a non linear timeline.

References

Jakobsen, T. Advanced Character Physics. *http://www.teknikus.dk/tj/gdc2001.htm*.

Schmidt, K. toxiclibs. *http://code.google.com/p/toxiclibs*.

Wikipedia. List of largest empires. *http://en.wikipedia.org/wiki/List_of_largest_empires*.

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