Visualizing empires decline

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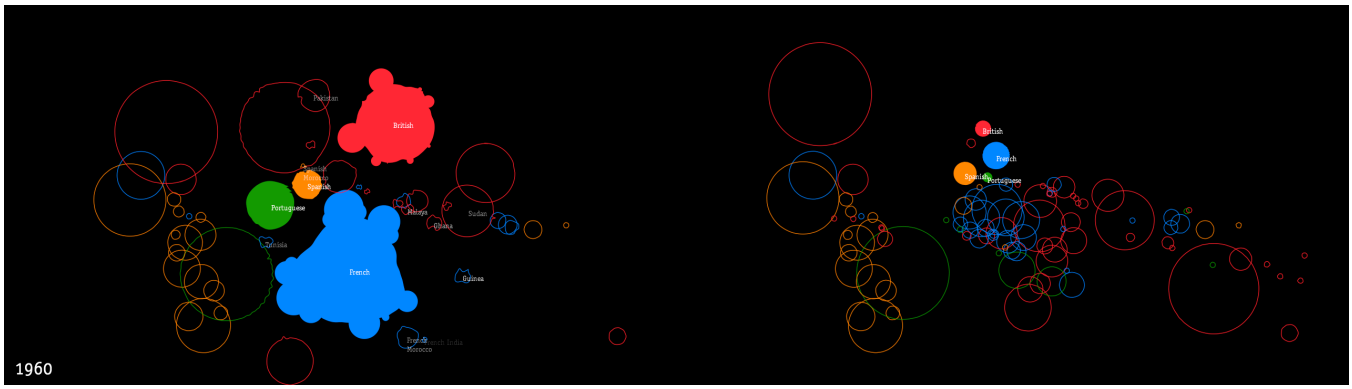

Figure 1 *On the left, a snapshot of the simulation in 1960 when most of the French colonies gain their independence. On the right, the end of the simulation after 2000 and displays all the former colonies stabilized in their geographic locations.*

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. The graphic representation forms were selected to attain a narrative that depicts the volatility, instability and dynamics of the expansion and decline of the empires. Furthermore, the graphic representation also aims at emphasizing the contrast between their maximum and current size, and portraying the contemporary heritage and legacy of the empires.

Soft-bodies are employed to represent the volatility and dynamic nature of the empires. The physics engine responsible by intra and inter bodies interactions was implemented using springs, which promotes 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

A circle that looks and acts like a soft-body is used for the representation of each empire. The area of each circle is directly proportional to the area of the corresponding empire. When a colony gains independence a new soft-body is created that persists in time and is attracted to the geographical position of the colony. The behavior of each soft-body is implemented building a skeleton for the circle by connecting particles with springs. The springs' implementation is provided by 'toxiclibs' 2d physics engine [Schmidt], which provides Verlet integration that tends 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. To attain repulsion, springs are created when the distance between particles of different bodies becomes inferior to a predetermined value. When the particles become distant these springs are deleted. The outcome of this process in a non-deterministic simulation, that exhibits different, yet similar, behaviors for the same data. Thus, the narrative is preserved. Nevertheless, the non-deterministic nature may cause glitches in the interactions between bodies.

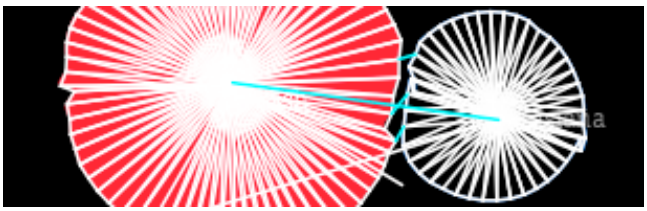

Figure 2 *Detail of the springs responsible for the system's behavior. The white lines represent the springs that form each body skeleton, as well as the per body geographic attractor. The temporary springs that implement bodies' collisions are represented in cyan.*

The simulation depicts the period of 1770-2010 using a non-linear timeline. The narrative advances one year per second, speeding up when no colonies become independent in the near future, which results in an animation of 2 minutes and 56 seconds.

The animations produced were published online on vimeo and youtube. They spread virally through the blogosphere collecting 470.000 views, and gathering the attention of graphic designers, information visualization enthusiasts and history teachers.

References

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