Simulación Gráfica

"War Simulator"

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Introduction

War is an event that changes the course of history, its study is important to detect causes, patterns, and subsequent effects to avoid repeating them and falling into the same mistakes as past civilizations. The main causes of war can be imperialism, territorial expansion, resentment, and ideologies.

In the case of imperialism, they seek to demonstrate their great power over other nations so that they fear them. When wars arise due to territorial expansion, normally by great empires, it happens because they seek new routes for their trade, expand the market and, most importantly, obtain more resources to be able to continue progressing. Resentment arises when one country is seriously affected by another or others, either in past wars or in foreign affairs A very clear example of this was Germany in the Second World War, the feeling of defeat and humiliation that it left in its people after the First World War made them develop thoughts and ideas of revenge, they wanted to return to greatness and that is why they committed atrocities to try to get it.

By investigating and studying the different wars that have taken place over time you can realize who is the real affected by these conflicts. Unfortunately, the civilian population is the most vulnerable and affected, some records indicate that in large battles there are usually more civilian deaths than the soldiers themselves, regardless of the side. On the other hand, those who are lucky enough to survive, have to live and witness inhumane acts, better known as war crimes.

Sometimes in history, we only learn the start and end dates of wars, but the truth is that the end of a war can only be the beginning of more problems, when the war ends it does not immediately return to normal, there is a period in which everything is rearranged and the countries learn from the decisions made, so the real question we are left with is: can a war end a war?

In this way, this project seeks to create an approach to a simulator of wars and coexistence between neighboring countries for its study. We will try to create, with the knowledge and foundations that we have, scenarios in which these countries can develop and decide whether to confront each other. In the end, we will reach some conclusions about what happened with the regions.

Initial data

The world will be divided into 7 continents for study in this simulation. These regions are Europe, Africa, Asia, North America, South America, Oceania, and South East Asia. To start our contest we must know the following information about said regions mentioned above:

- Territory
- Population
- Population growth rate
- Income
- Literacy rate
- Military spending by % of GDP

We have all this information on an Excel spreadsheet available at: ⊠ simulación.xlsx

Once this data is captured, we can have an approach to the configurations of the nations and thus be able to determine their behavior in the face of events that occur in their environment.

Now we will present five different scenarios of our simulation, with each one having differences in terrain and other inner data. These "stories" were run 30 times and averaged to get conclusions out of each scenario. We start with the data used, then a hypothesis, followed by the results in graphs, and finally the conclusion.
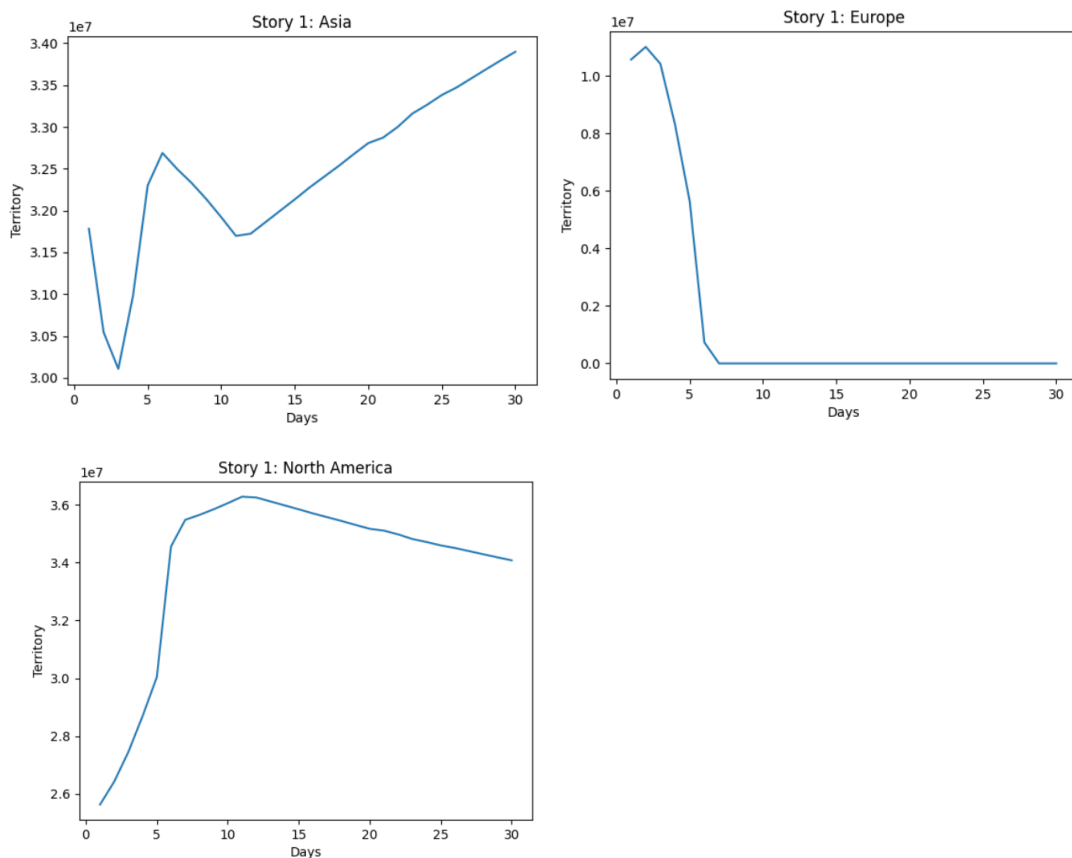
Stories

Story 1: Present day

The first simulation we ran is the one with our initial data, without changes. The position of the continents is as geographically accurate as possible, to account for real "borders".

Hypothesis: either North America or Asia wins. In the real world, that would be the obvious bet to consider, so the same applies to our story.

Results:

Conclusion: The only note-worthy continents in this simulation were Asia, North America, and Europe; the other ones were quickly conquered by one of them very quickly. The hypothesis is correct: North America and Asia would submit the others quickly and get to a 1vs1 battle. Europe tried to defend itself, but being surrounded by the other two left him outnumbered. Now, between North America and Asia, it seems that most likely Asia would win in a prolonged fight, probably because of their population.

Story 2: Africa center

In this universe, Africa is the center of the world and the other regions don't have borders with each other. The continents are all around Africa and can only communicate with the others through it. Also, we gave Africa an increase in Income and Military Spend: [1969.69 --> 12354.2], [1.76 --> 6.76].

Hypothesis: even with the increase in income and military spending, Africa will eventually lose, and the continent that takes Africa will win the war.

Results:
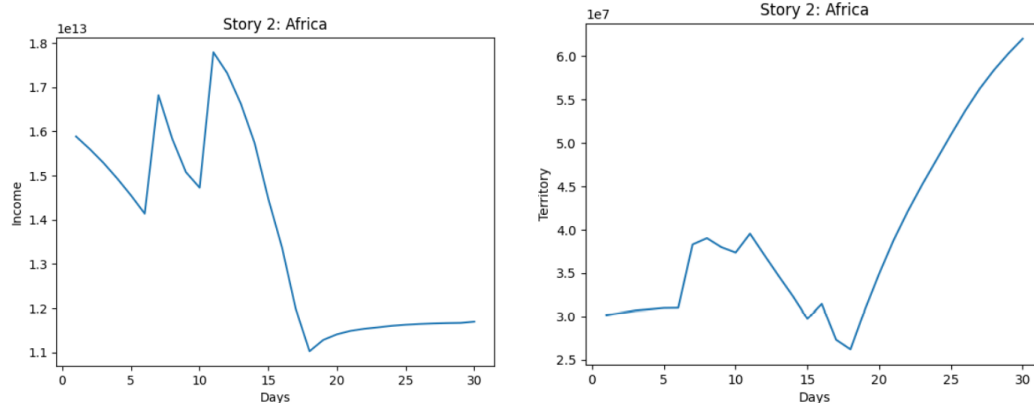
Conclusion: It seems that at first, Africa tries to gain as much territory as possible and succeeds, until one of the other continents attacks from another side. The exponential gain in its territory from day 18 is probably because on those occasions Africa didn't disappear sooner, and could get away with more territory because of luck.

Story 3: Cold War 2

In this universe, we have the sequel to the Cold War, with basically the same conflict. The world is geographically accurate to ours, and the conflict is divided into two: the Capitalist Faction (North America, South America, Europe, South-East Asia, and Oceania) and the Communist Faction (Asia and Africa). The two biggest powers are North America and Asia. The differences are:

- Increase Military Spend in Asia, Africa, and North America; Asia and North America because they are the main enemies, Africa because Asia would help his ally with war support, not a monetary one. ([3.4 --> 12.4], [1.76 --> 4.76], [2.70 --> 9.70]).
- Increase Income in South America, Europe, South-East Asia, and Oceania. These are the allies of North America; they will help the other continents with money to be easily conquered later on but with enough resources to gain from them, or try to take a stand against Asia. ([7692.31 --> 17692.31], [22909.96 --> 62909.96], [4523.84 --> 34723.84], [46209.11 --> 86209.11]).
- The Growth of all continents is halved.

Hypothesis: North America and Asia will "eat" their allies or enemies and fight each other. One will win.
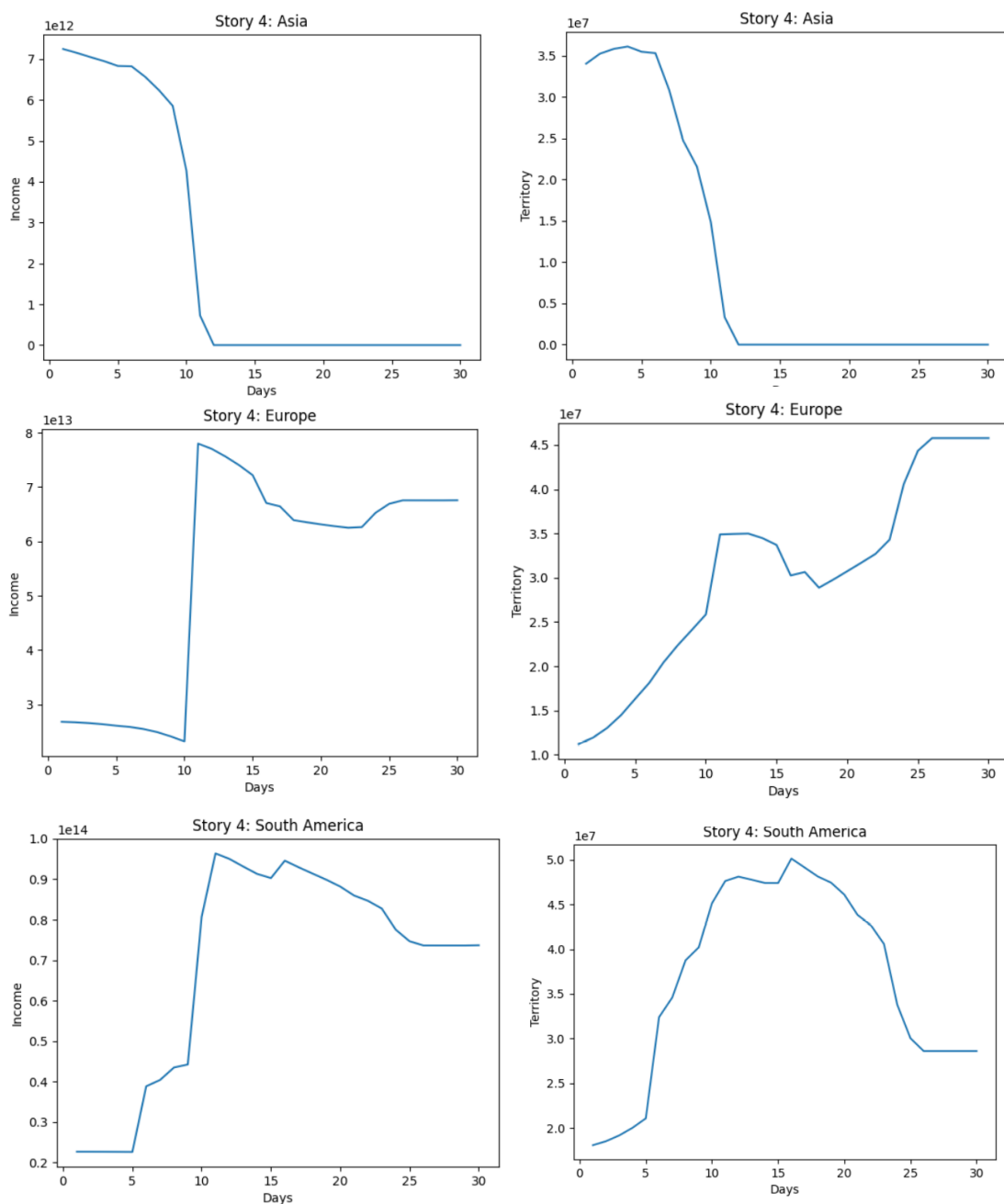
Results:
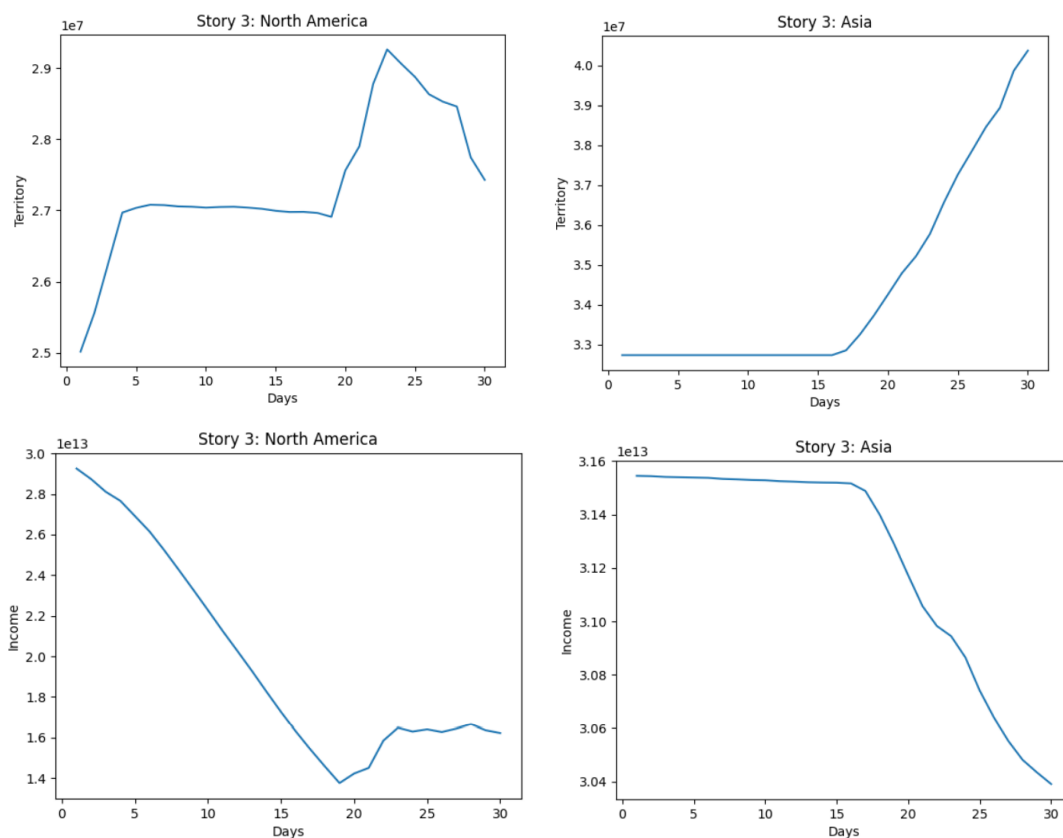
Conclusion: It seems that generally, North America and Asia finish the month with a lot of territories, meaning that they are most likely the last two surviving forces. But more interestingly is the fact that North America seems to lose territory in the final days, while Asia keeps getting more; its meaning is obvious: Asia starts conquering North America when they are 1v1. Seeing the simulation, the conflict can reach a peaceful conclusion sometimes.
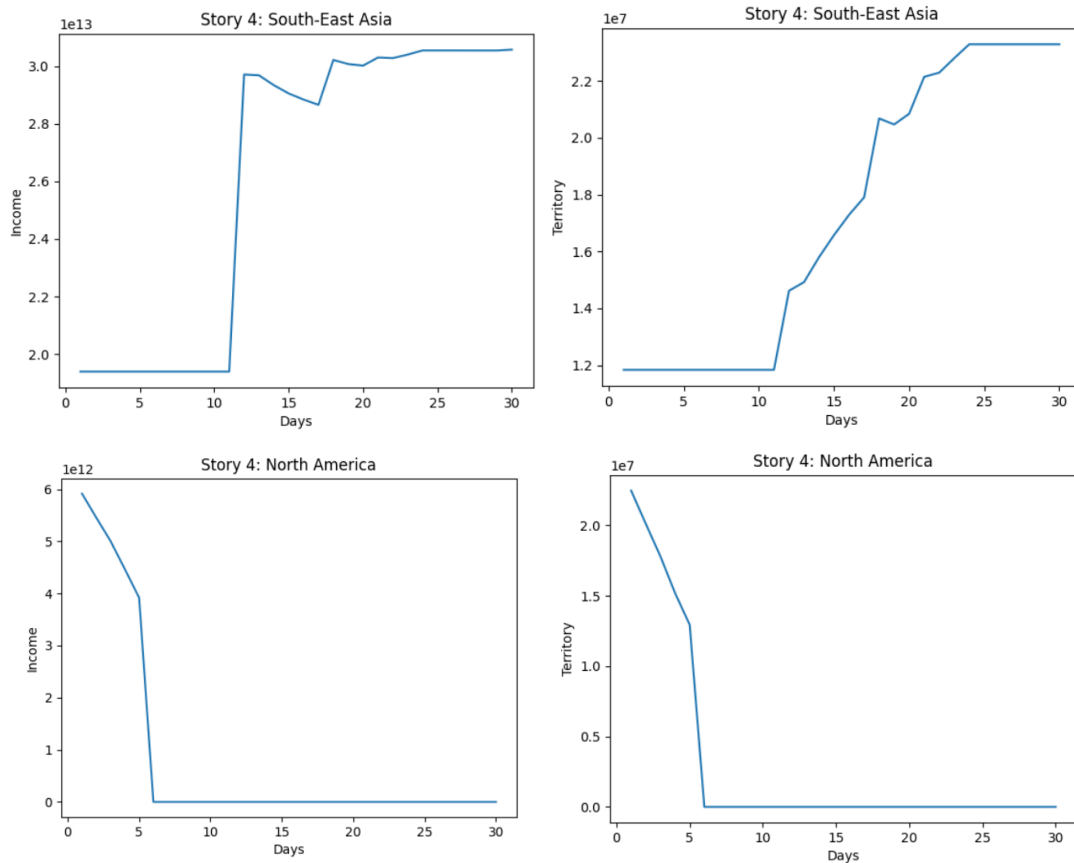
Story 4: Switch of power

In this universe, the continents are ordered differently, like a downside crescent moon. Also, the countries that are powerful in our reality are weak in this reality, and vice-versa. That means that the Income of North America and Asia goes down ([50984.45 --> 10984.45], [7829.11 --> 1829.11]), while the Income of South America, Europe, and South-East Asia goes up ([7692.31 --> 53692.31], [22909.96 --> 35909.96], [4523.84 --> 28523.84]).

Hypothesis: Either South America or Europe wins, the former because of its territory, the ladder because of the relative position of the continent.

Results:

Story 4: South-East Asia (Income) and Story 4: South-East Asia (Territory); Story 4: North America (Income) and Story 4: North America (Territory)

Conclusion: As expected, North America and Asia disappear very quickly. Of the three new big powers, Europe seems to win the most of the time, with South America in second place (probably because of the effort to conquer Africa) and Sout-East Asia in third place. But this is because of the limited time: if you gave South-East Asia more time, its tendencies indicate they could conquer the world. So, my hypothesis was correct, just not complete.

Story 5: Oceania conquest

In this universe, Oceania suddenly founds riches beyond comprehension and a desire to rule the world (some imply that aliens are helping them). The world is geographically accurate and the other continents stay the same as in our world, but Oceania gets an increase in Growth, Income, and Military Spend: [1.4 --> 8.4], [46209.11 --> 356209.11], [2.10 --> 102.10].

Hypothesis: Oceania will conquer the world easily.

Results:
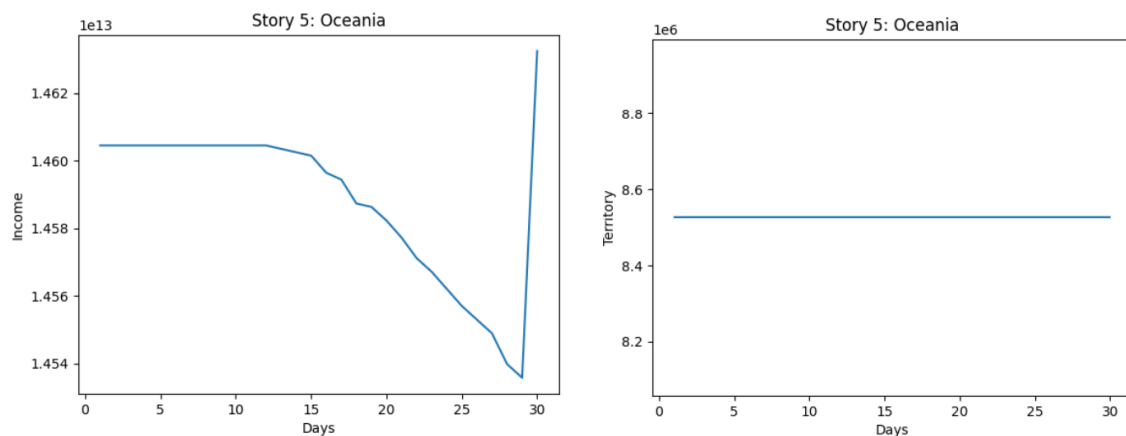
Conclusion: Indeed, Oceania conquered the world. They lose very little money on their invasions and quickly get more with other continents under their control. Weirdly, the chart on the right is wrong, but we couldn't see why; the fact remains that in the simulation, Oceania beats everyone in time. But to do that, they needed so much money it is ridiculous.

Conclusion

When my previous team (Carlos, Alex, Jorge, and me) proposed the War Simulator, we thought it would be way easier than this final product. Each task: gathering data, simulating the war and making it visible was a challenge on its own. We managed to do almost everything of the requirements; the only thing missing is a proper d3 visualization method, to which we instead changed to a *matplotlib* representation.

Each story was insightful in its own way: North America and Asia are world powers for a reason; peace is very, very difficult to achieve without a time limit to the wars; for a smaller country to conquer others and stay in power, they would need exorbitant amounts of money; and luck is a very important factor in battles.

The hardest parts to do were the simulation itself (the meat of the project) and translating the results for the graphs and the visualization grid. Credit where credit goes, Carlos Avila was the pillar that made it work, helping in the other areas too. We couldn't have done this without him.

I'm glad we did this project, but it was definitely time-consuming; but for the last activity to do before our *specialty*, I suppose it was a very ideal way to summarize our experience of the last four years and a nice send-off.

Sources

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