

Accurately Simulating The Battle Of Thermopylae to Analyze “What-If” Scenarios

Introduction

Simulations are used for a variety of different purposes ranging from video games to analytic tools. As an analytic tool, a battle simulation can explain why something happened or predict what will happen. Its value is in its ability to be modified to fit any situation. As a result, simulations can be used to analyze historical events with the goal of learning new information about them or facilitating the study of “what-if” scenarios [1]. For the Battle of Thermopylae these methods can give us a better understanding of the significance that Ephialtes’s betrayal, the Festival of Carneia and the Greek army’s defensive position had on the outcome of the battle.



Figure 1. Location of the Battle of Thermopylae [2].

The Simulation

Using the Python module SimPy, “ a process-based discrete-event simulation framework,” I developed a model that could be modified to simulate counter-factual scenarios.

The model included:

- Historical quantities
- Scheduled events in a hierarchical structure according to the historical record (Figure 2)
- A combat system that resolved Greek-Persian interactions individually

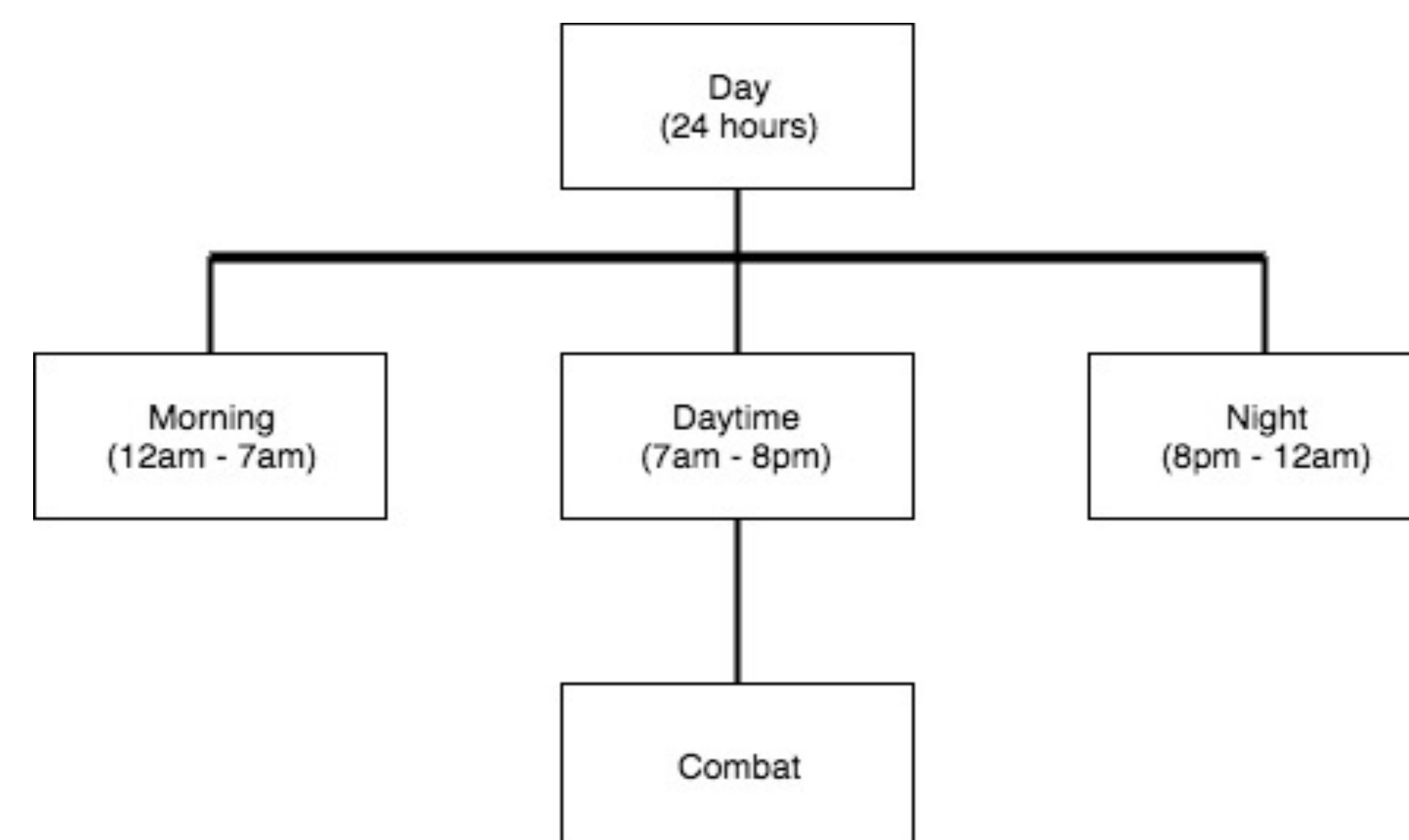


Figure 2. Hierarchical day structure.

Conclusions

The results of the counter-factual simulations explain the significance of the specific circumstances of the battle to its historical outcome. In the absence of Ephialtes’s betrayal, the Festival of Carneia and the Greeks’ defensive position at the “Middle Gate”, the Greek army consistently out performed the historical scenario. Thus, we can conclude that each of these factors negatively impacted the Greek army’s longevity, contributing to their ultimate defeat at the Battle of Thermopylae.

		Day 1	Day 2	Day 3	Total
Greek	Average	168.48	42.06	1345.36	1555.9
	Standard Deviation	14.32	8.34	7.38	14.48
Persian	Average	9811.72	3804.34	7253.4	20869.46
	Standard Deviation	125.06	70.88	18.89	130.32

Figure 3. Historical results produced by the model.

Historical Model Results

According to Herodotus and modern scholars [3] [4] the battle resulted in the death of ~20,000 Persians and ~1,500 Greeks. In 50 trials, the historical model consistently produced historically accurate results (Figure 3)

The counter-factual scenarios simulated:

- What if Ephialtes did not betray the Greeks?
- What if the battle did not occur during the Carneia Festival?
- What if the Greeks did not choose to fight at the “Middle Gate”

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References

- [1] D. Gutierrez, B. Frisher, E. Cerezo, A. Gomez, and F. Seron, “ Ai and virtual crowds: Populating the colosseum,” *Journal of Cultural Heritage*, vol. 8, 2007
- [2] United States Military Academy, West Point. *Atlas for Ancient Warfare: The Battle of Thermopylae*. URL: <http://www.usma.edu/history/SitePages/AncientWarfare>
- [3] T. Holland and P. Cartledge, *The Histories: Herodotus*. New York: Penguin Group, 2014
- [4] Ernie Bradford. *Thermopylae. The Battle for the West*. Open Road Media, 2014, p. 34.

The Battle of Thermopylae (480 BCE)

Most famous for its revival in the movie *300* (2007), the Battle of Thermopylae was a pivotal event in the course of the Persian War and, thus, in the course of history. The battle occurred at a small mountain pass as a last ditch effort by the Greeks to slow the Persian advance south to Athens. Famously, a small Greek force, including 300 Spartans, held the Persians for three days. This gave the Greeks enough time to prepare a counter attack that would drive the Persians out of the region. The end of the Persian War led to the construction of the Acropolis and the Parthenon in Athens and, ultimately, the preservation of Democracy [2].