War and Peace: Modelling the Battle of 73 Easting

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1 INTRODUCTION

On 26 February 1991[2], the last large scale tank battle was fought between the UN coalition forces against the Iraqi Armored Division as part of Operation Desert Sabre. The result was the decimation of the Iraqi forces with them losing 160 tanks compared to the UN forces losing none of their tanks. If the Iraqi commanders could have modelled this battle before hand, would they have chosen a different course of action?

2 APPROACHES

This tutorial will focus on modelling the same battle using different approaches, each an improvement on the previous by including additional factors that guided the course of the battle

2.1 Continuous Time Model

The simplest way to approach this military battle is to use a continuous time model, the most well-known of which is Lanchester's Square Law[1]. This is a series of differential equations developed to model the outcome of a battle purely by the relative strengths and firepower of each army, disregarding the spatial aspect or ground tactics. Such a continuous time model would be simple to implement, but lacks the stochastic behavior one would aspect of a real battle.

2.2 Markov Chain Model

An improvement on a simple continuous time model, a Markov chain model includes stochastic elements related to a kill chain within a battle. When two individual tanks are placed in a battle, there is a chain of probabilities that is guided by the state the tank is in and its given parameters. For example, when idling, there is a probability that the tank will detect an enemy within range and if it does, a probability its shot hits, and a probability the shot does damage. Each successive state is only dependent on the previous state, with the final outcome being a probabilistic model. This model however, does not account for the spatial element where elements such as terrain and tactics cause states to be codependent on more than one previous state.

2.3 Agent Based Model

Integrating the idea of a stochastic Markov chain into a spatial environment yields a agent based model. Such a model would encompass predefined user behavior, akin to a Markov chain, but would allow agents to independently move about the area. This will be as close to the actual battle, without fighting the battle.

3 DESIRED OUTCOME

We hope to show that a battle produces self-emergent behaviors, where although an individual tank has its own autonomy to function, the fundamental nature of war leads to predictable outcomes that can be modelled and simulated. It was also be easier to model parameter changes, such as technological or strategical improvements, to provide guidance to future military doctrine and policy.

REFERENCES

[1] Ronald L. Johnson. 1989. Lanchester's Square Law in Theory and Practice. (1989).
[2] Logan Nye. 2016. The story of 'the last great tank battle' where the US destroyed 30 Iraqi tanks. *Business Insider* (Feb. 2016). https://www.businessinsider.com/the-last-great-tank-battle-where-the-us-destroyed-30-iraqi-tanks-2016-2