Tanks Commanders

Reinforcement Learning Project

Itay Lavi-Okabi

# Introduction

## Project Design

### System Design

The system is divided to “back” – meaning the ML algorithms & communication, and “front” – a GUI for visualizing the tanks to the client. The client should be able to visualize the algorithm as he sees fit, which is why the back is completely separated from the implementation of the GUI, as long as it follows the API.

The client holds a GUI and connects to the back. In response he gets a finished gameplay – text file describing the game. The gameplay includes initializing and positioning the tanks, every command given to the tanks, and the game’s aftermath.

### Game Flow & Algorithmic Plan

A **turn** – one frame. Hence the unit measure is [F]. Assume 25 frames per second [FPS].

Battle Zone (Reinforcement),

Training Zone (Genetic)

Each tank decides what to do every turn – moving, shooting, or scanning. Once a decision is made (let us call it a **plan**) a list of proper steps for executing it is generated, containing the following options (let us call them **actions**): moving one step forwards/backwards, rotate, rotate turret or shoot. Remember: the step size or rotating angle a tank can make in a single turn is determined by its properties. So, if a plan is saying “rotate 90” and the tank is slow – say rotation size is 0.5 – it will take it 180 turns to execute this plan (around 90F / 25FPS = 7.2 Seconds).

#### Genetic Algorithm

Bigger body – Higher Defense, Lower Mobility

Bigger turret – Higher power, Slower to rotate

Higher Cost – Larger Sonar & Better Reliability, Lower Chance to being produce

## Plan

We start with a basic GUI made with React.js that allows to place, move and rotate Tank objects. After that, we go to building the back – a Node.js server that will cover the Python ML algorithms as mentioned above. Then it’s time to work on what we all gathered here for – an amazing top notch edge of technology Machine Learning. To start off easy, we will actually begin the ML journey with the Genetic Algorithm that will – hopefully – improve the tanks used

# GUI (React.js)

Focusing on visualizing and controlling the environment and its objects.

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1. Creating an Environment & Training Zone
2. Creating Tank object that can be placed in different positions.

A screenshot of a computer

Description automatically generated with low confidence

1. Make the tanks move and rotate with commands (read from txt file). Purpose: understand how to move them smoothly and how to generate a proper txt file to achieve that.