ROBOMASTER: TECHNOLOGY IN MODERN WARFARE THROUGH THE LENS OF A ROBOTICS COMPETITION

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Introduction

Modern warfare

- Ever-evolving, prioritising technological innovations and agility on the battlefield
- Unique challenges especially as tech's accessibility rises
- Multi-faceted environment with many stakeholders

Learn about such challenges in a fun, unique way
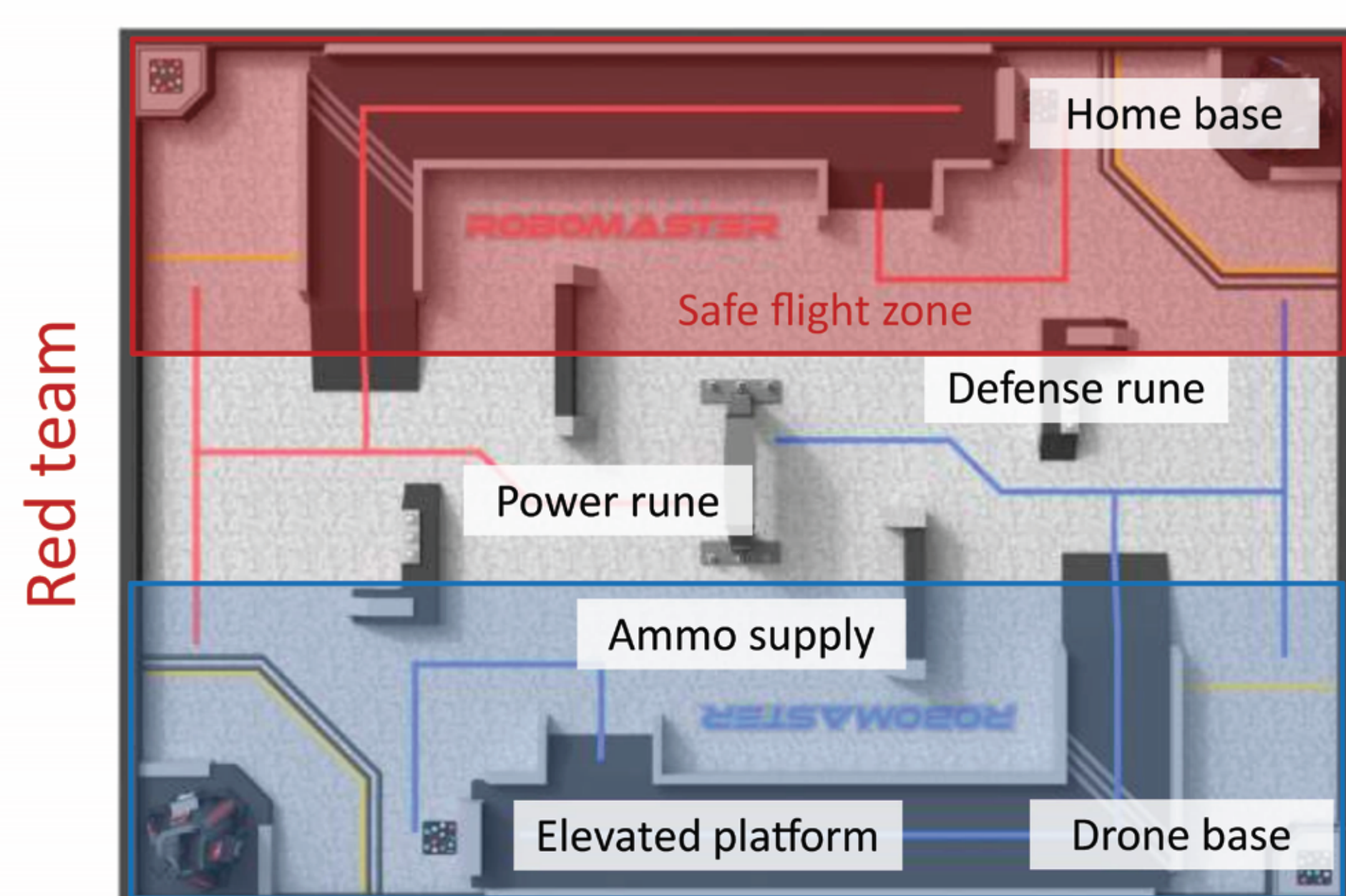
The RoboMaster Youth Tournament

Objective

Team-based, 1v1 combat
Score the most damage to enemy's base

Rules

3 robots per team, each with own functions
Can receive damage when hit by enemy robots

Red team / Blue team

- Home base
- Safe flight zone
- Defense rune
- Power rune
- Ammo supply
- Elevated platform
- Drone base

Pilots facing away, only seeing through camera POV

Drone operator relays info

Defence rune
Scan to increase robot protection

Power rune
"Make-24" game to increase damage

Home base
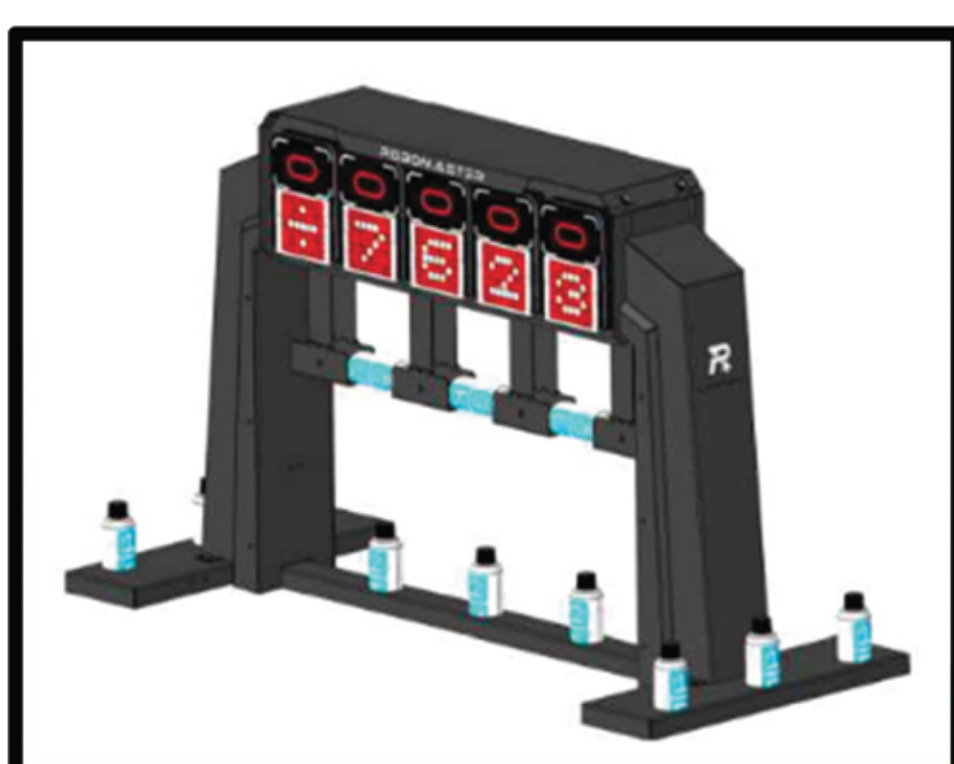Shooting target to get points

Standard (x2) - *DJI RoboMaster S1*
Fires gel pellets at targets (blue rings)

Engineer (x1) - *DJI Robomaster EP*
Picks up and collects ammo bottles to be scanned by standards

Aerial (x1) - *DJI Tello*
Drops ping pong ball into enemy chute to activate damage boost

Autonomous — 1 min
↓
Manual — 2 mins
↓
Autonomous — 1 min
↓
Manual — 1 min

Our strategy

Key idea: **Staying nimble and flexible**

- Bouncing back after losing 3 of 4 practice games
- Leaving out things that don't work in favour of simplicity
- Building on other teams' strategies

1 Gameplay

Build up as much ammo as possible
- Standards alternate between distracting enemy fire and scanning ammo refill bottles in first manual phase, without firing themselves in order to conserve ammo.
- Engineer modified to grab bottles more effectively
- Full on attack on opponent base during second manual phase, given sufficiently high HP
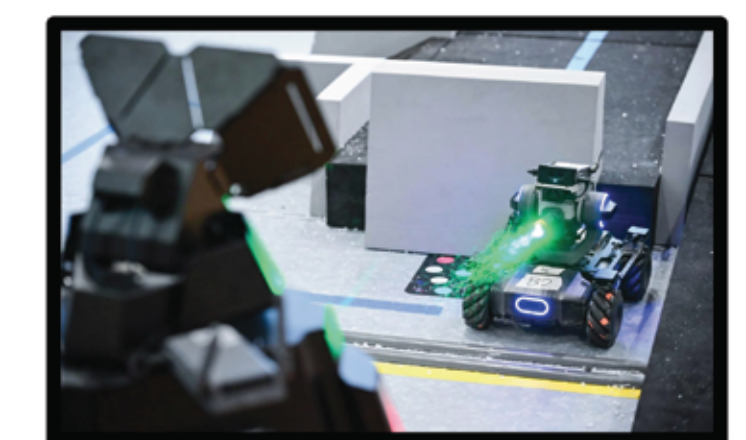
2 Code and hardware

Make the most of provided capabilities
- Features such as line tracking etc. were inaccurate
- Lack of time to debug, measure etc.
- Instead we opted for simpler approaches e.g., simple coded commands during automatic phases

3 Software and modelling

To gain a competitive edge
- Made full use of provided simulation software
- Custom code for Make-24, automatic shooting optimisation algorithm

Code to fire with **dynamic correction factor**

Decreased lag and **improved response**
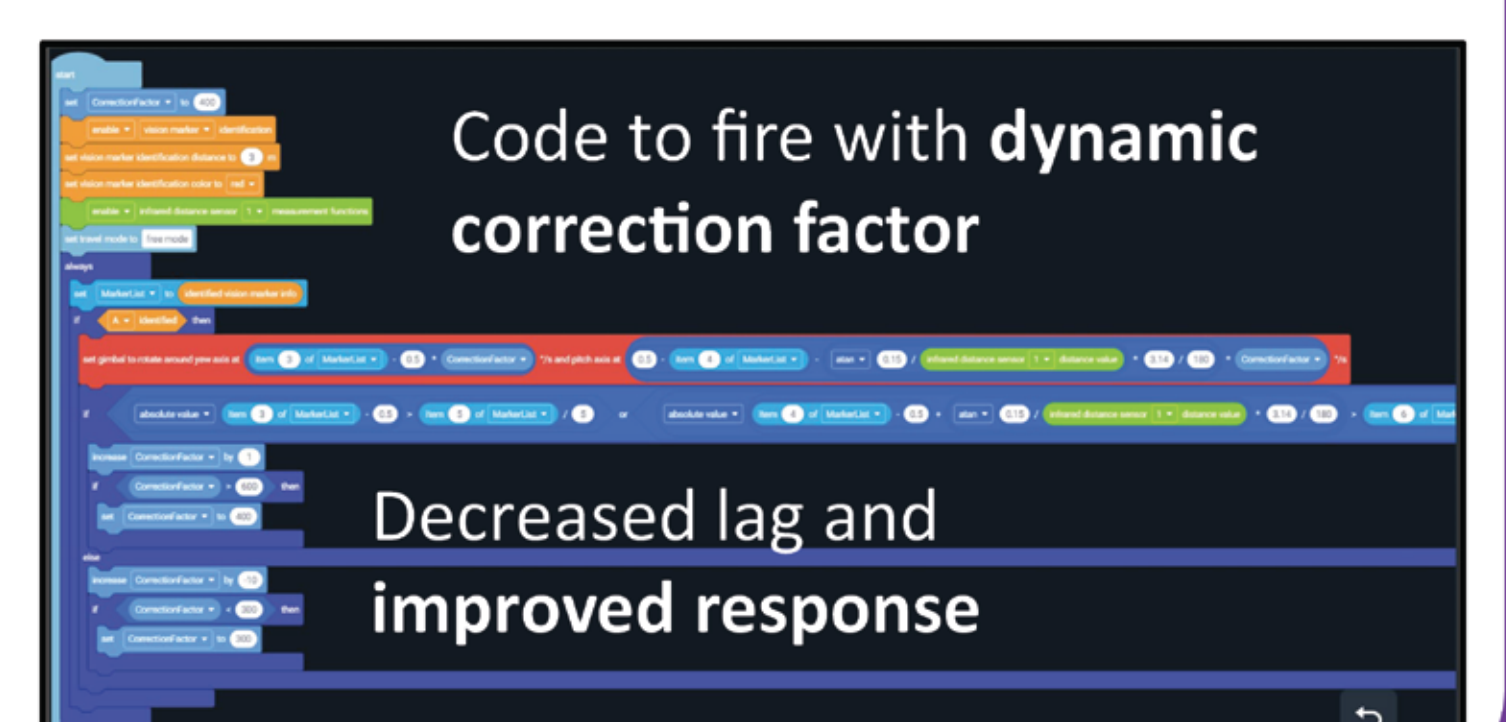
Our takeaways and applications

Apt simulation of future military operations, giving insight into complex battlefield decisions

Drones, e.g., Russia-Ukraine asymmetric warfare

Unmanned tanks and vehicles similar to the robots we handled
E.g., maintenance, supply issues