KU LEUVEN

First Intermediate Presentation:

# Reinforcement learning of action sequences in table football

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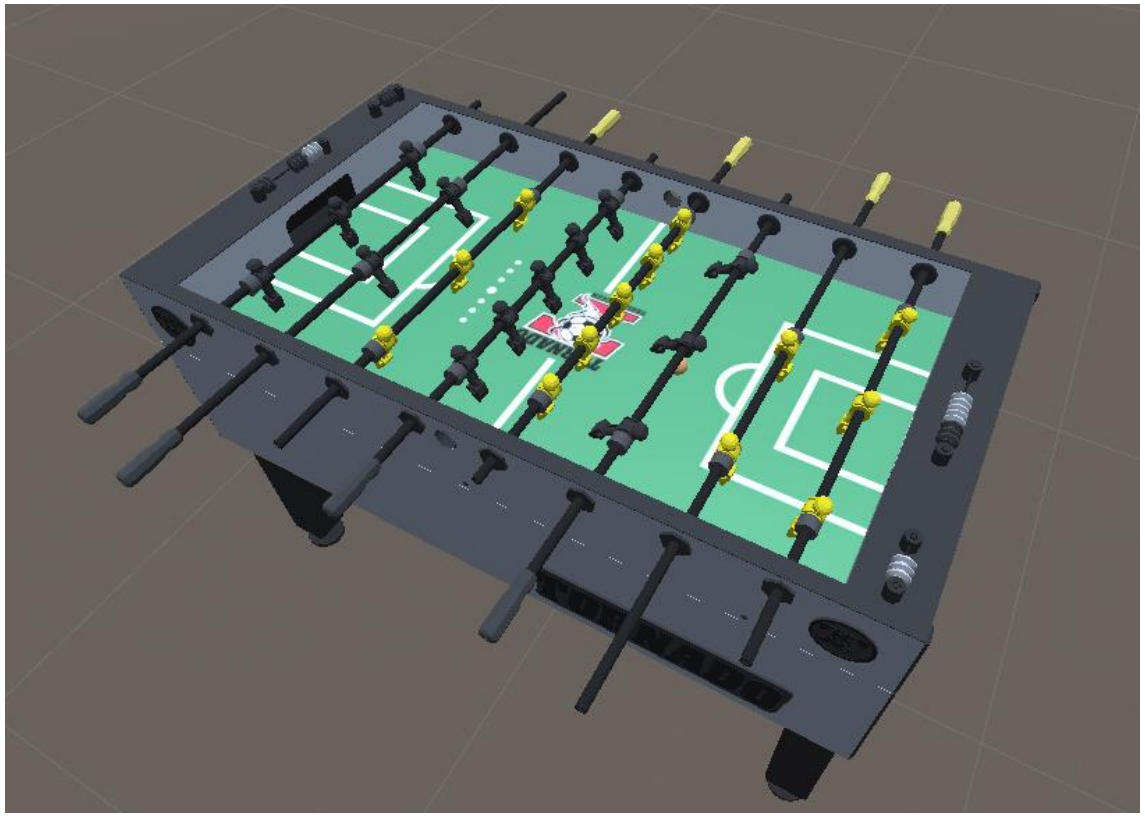
# Context & Motivation

- Development of robotic foosball.
- Benchmark for any Reinforcement Learning implementation.
- Nature of the game: no RNG, not only reactive, continuous environment,  adversarial.
- From theoretic RL implementation to real life robotic implementation.



# Problem statement

- Goal is passing between controllable players.
- Types of passes:
  - Ball control
  - Pass static opponent
  - Pass dynamic opponent
  - Different rails
- Metrics: speed/time, accuracy to the end position (speed at that position), success rate (opponent type).
- Get ball to shooting position from goalkeeper.

# Methodology

- Tools:
  - Unity (ML-agent)
  - C# controller + python (Stable Baselines)
- Methods:
  - Model-free Q-Learning.
  - DRL:
    - Deep Q-Learning (E-Greedy).
    - Deep Policy Network.

- Discrete Agent actions: (min-max)
  - Rotation.
  - Translation.
- Continuous Environment:
  - Ball Position (x,y,z).
  - Ball Speed.
  - Current position of players/enemies.
- Rewards:
  - Ball reaching location.
  - Distance to location.
  - Speed at location.

# Planning

- Set up the simulation environment (unity project working properly)
- Set up controllable agents
- Define states, actions, rewards, metrics etc.
- Define promising RL approaches
- Implement direct pass with different methods as baseline.
- Implement different passes and optimize performance
- Determine best working methods
- Create sequences that work vs different players: Get the ball from the goalkeeper to a scoring location.