Minecraft as a Platform for Project-Based Learning in AI

Sameer Singh University of California, Irvine. sameer@uci.edu

http://sameersingh.org/courses/malmo

Project Courses in AI
Project courses are great for learning!
• define own goals, pick approach, abstract concepts → concrete code, teamwork, evaluate/analyze results, …

Existing courses mostly define the problem and techniques for the students 😞

Minecraft
An open-world sandbox game with elements of:
• Exploration
• Resource gathering
• Crafting
• Construction
• Combat
https://www.minecraft.net/

Project Malmo by Microsoft Research
• AI experimentation platform on top of Minecraft
• Programmatic access to observations/actions

```
def player(obs) {
    return action
}
```

• Observations: pixels, gridworld, objects, inventory...
• Actions: generate world, disc/continuous movt, ...
https://www.microsoft.com/en-us/research/project/project-malmo/

Course Description
• Duration: 10 weeks long undergraduate course, ~120 students
• Teams: Groups of a maximum of 3 students
• Open-ended: students have to define their own projects, no constraints
• Real-world skills: submit webpages, Github repos and YouTube videos

So far…
offered 3 times (currently 4th)
260 students, 90 projects

Example Projects

Revival
• Style transfer of images
• real photos ↔ Minecraft
• CycleGANs
• https://sijielu.github.io/Revival/

RoboFarm
• Efficient Farming
• Planting/harvesting
• Genetic algorithms
• https://daniel-davies.github.io/13-RoboFarm/

MinePilot
• Self-driving car
• Steering, Accel/brake
• Deep RL from pixels
• https://ziyangz5.github.io/MinePilot/

FireEscape
• Get to exit before fire
• Discrete movement
• Tabular Q-Learning
• https://joshlopez97.github.io/FireEscape/

speech2craft
• Command following bot
• Navigation, gathering, etc.
• Speech recog, NLP parsing
• https://hiroishikawa.github.io/speech2craft/

MinePac
• Play Pacman
• Navigation, gathering, etc.
• Local/heuristic search
• https://avielmenter.github.io/MinePac/

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