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BUILDING TOOLKIT FOR MULTI-AGENT SYSTEMS

WHAT IS A MULTI-AGENT SYSTEM?

- A multi-agent system (MAS or "self-organized system") is a computerized system composed of multiple interacting intelligent agents. Multi-agent systems can solve problems that are difficult or impossible for an individual agent or a monolithic system to solve.

THE PROBLEM?

GENERALIZED MULTI-AGENT
EVALUATION PLATFORM

ARENA

ARENA

- Unity based
- Compatible with different types of games
- Provides an standard for testing multi agent games
- Reinforcement learning games
- 35 games, 27 have never been investigated, 8 already existed and were improved.
- 5 different types of agents

WHAT ARENA IS HOPING TO IMPROVE/CONTRIBUTE

- Boosting creativity through multi-agent communication
- Agents that can be used in different games
- Different training schemes
- Configurable social relations (by different reward settings)
- Creating new games and AI solutions to yet unsolved game problems

ARENA VS OTHER SYSTEMS

- DeepLearning
- PhychLab
- Malmo

OUR EXPERIENCE

TESTING ARENA

INSTALLATION

- Simple
- Well documented
- Only requires unity and git

INTERFACE

- Friendly
- Intuitive
- Well explained

Unity File Edit Assets GameObject Component Invector Tutorial Substance Window Help

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Unity 2018.4.9f1 Personal - Prueba1a.unity - Arena-BuildingToolkit - PC, Mac & Linux Standalone (Personal) <Metal>

Center Local

Collab Account Layers Layout

Hierarchy

Create

Prueba1a*

- Main Camera
- GlobalManager
- TopDownCamera
- VisualizationCamera
- World
- Team1
  - ArenaCrawlerAgent-v1 (2)
  - ArenaCrawlerAgent-v1 (3)
- Team2
  - ArenaCrawlerAgent-v1
- ArenaCrawlerAgent-v1 (1)
- Directional Light

Scene Game Asset Store

Shaded 2D Gizmos

Persp

Inspector

GlobalManager Static

Tag Untagged Layer Default

Prefab Open Select Overrides

Transform

Position	X 9.8789	Y 10.130	Z 1.8498		
Rotation	X 0	Y 0	Z 0		
Scale	X 1	Y 1	Z 1		

Arena Node (Script)

Script ArenaNode

Node Settings

Node ID 0

Living Condition

Max Num Living Steps 1000

Living Condition At Least Specific Number

At Least Specific Numl 2

At Least Specific Portic 0.5

Reward Scheme

Reward Scheme Scale 100

Reward Functions (Competitive)

Is Reward Ranking

Ranking Win Type Depart

Is Penalize Tie

Reward Functions (Collaborative)

Is Reward Distance

Distance Base 1 None (Game Object)

Distance Base 2 None (Game Object)

Is Reward Time

Time Win Type Longer

Utils

Transform Reinitializers

Global Manager (Script)

Script GlobalManager

Broadcast Hub

Add New Remove Last

Brains Control

GeneralPlayerDiscrete

Max Steps 0

Project Console

Create

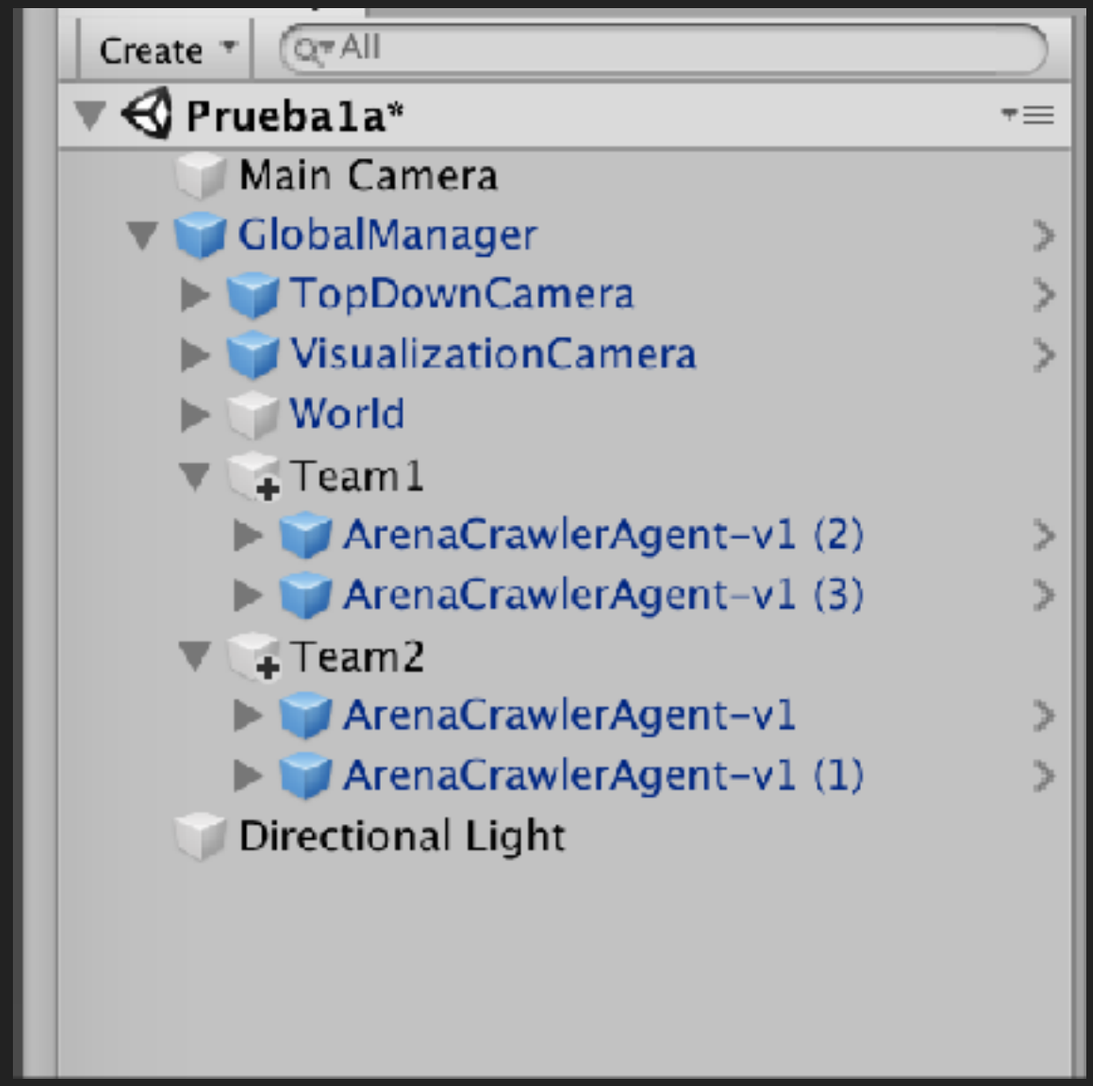
- Destroyable
- Disturber
- Eatable
- Effect
- Goal
- KillGate
- Playground
- UI
- SharedScripts
- ThirdPartyAssets
  - BarcadeGamesAssetPack
  - Boxing
  - CardGameObjects
  - EasyRoads3DAssets
  - FantasyDefensiveStructures
  - FenceChained
  - FloodedGrounds
  - FreeTrees

Assets > ArenaSDK > AgentPrefabs > BasicAgent

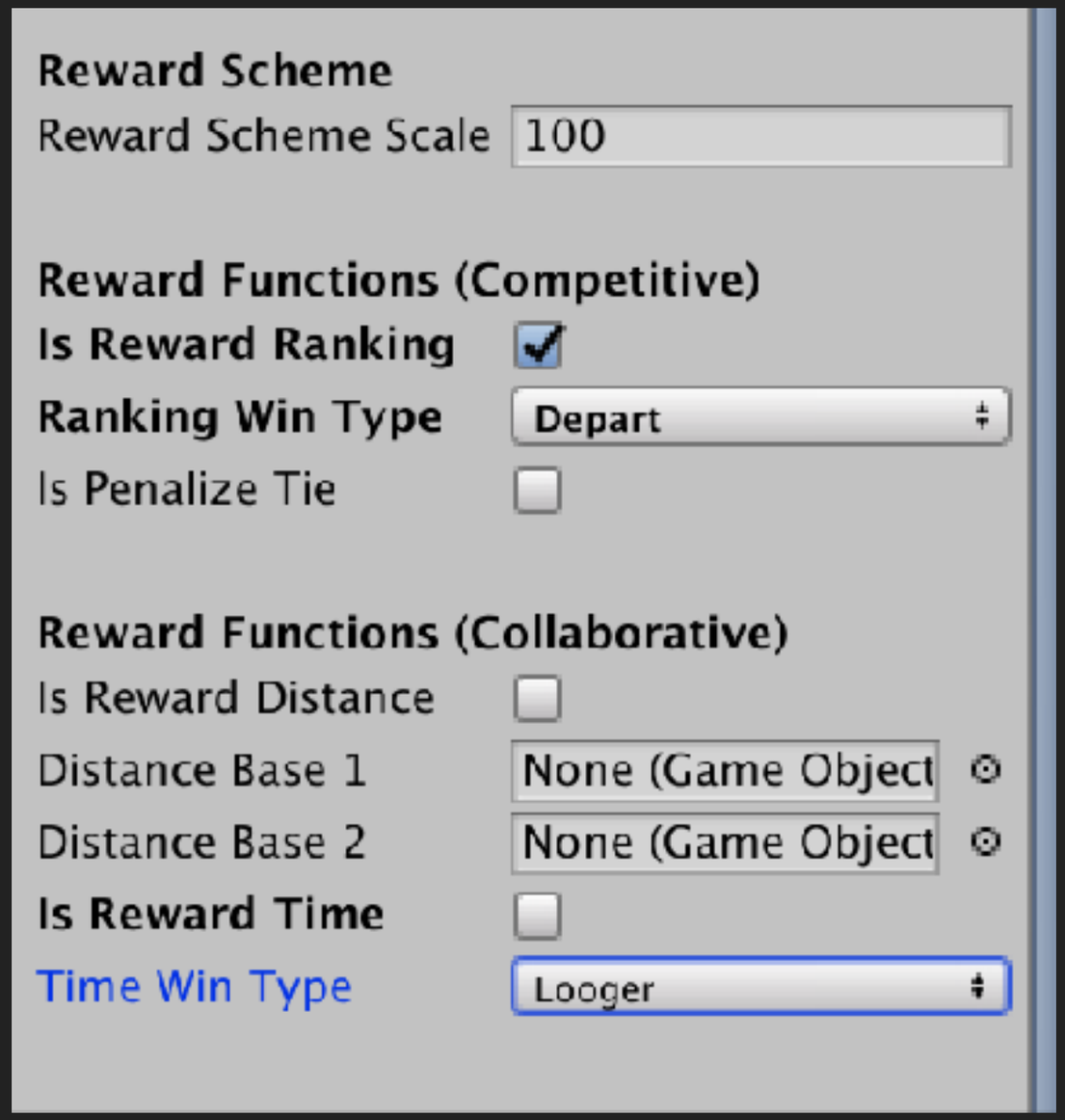
BasicAgent BasicAgent_V1 BasicAgent_V2 BasicPlayer BasicPlayerN... Example Gunner-Basi...

SOCIAL TREE CONFIGURATION

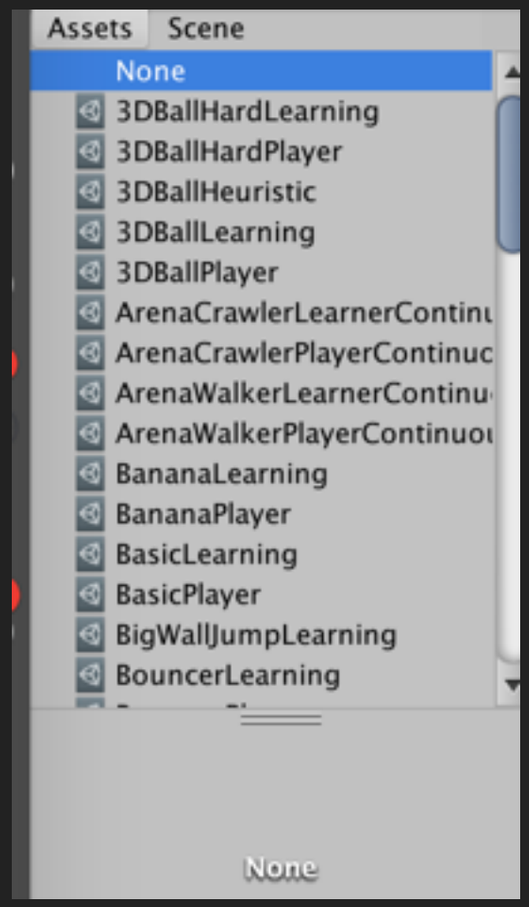
- Each Arena node has an ID
- Global manager that works as a root
- Each node control the others on the bottom
- Configurable settings like collaborative and. comparative modality



REWARD SCHEMES

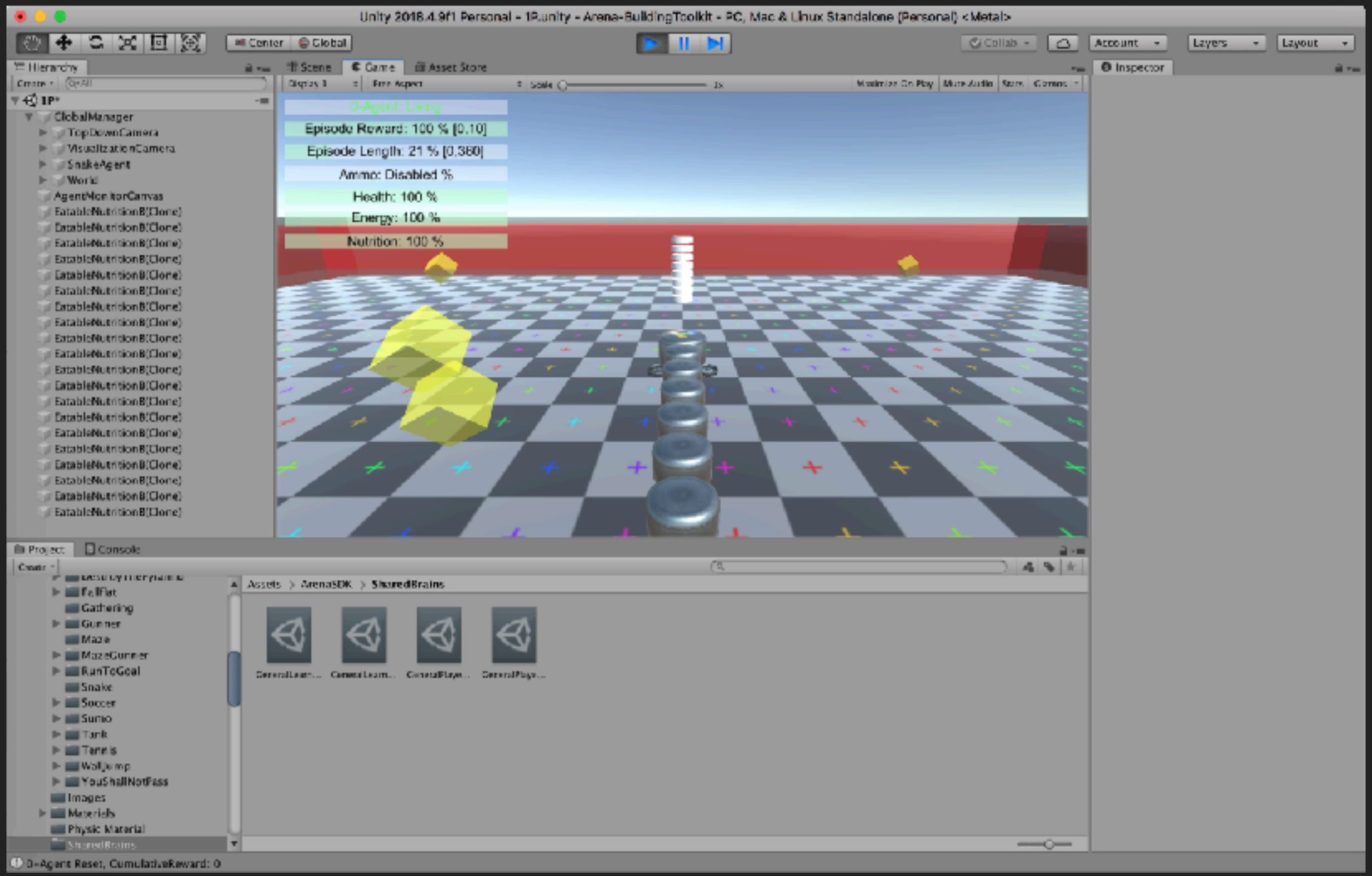


BRAINS

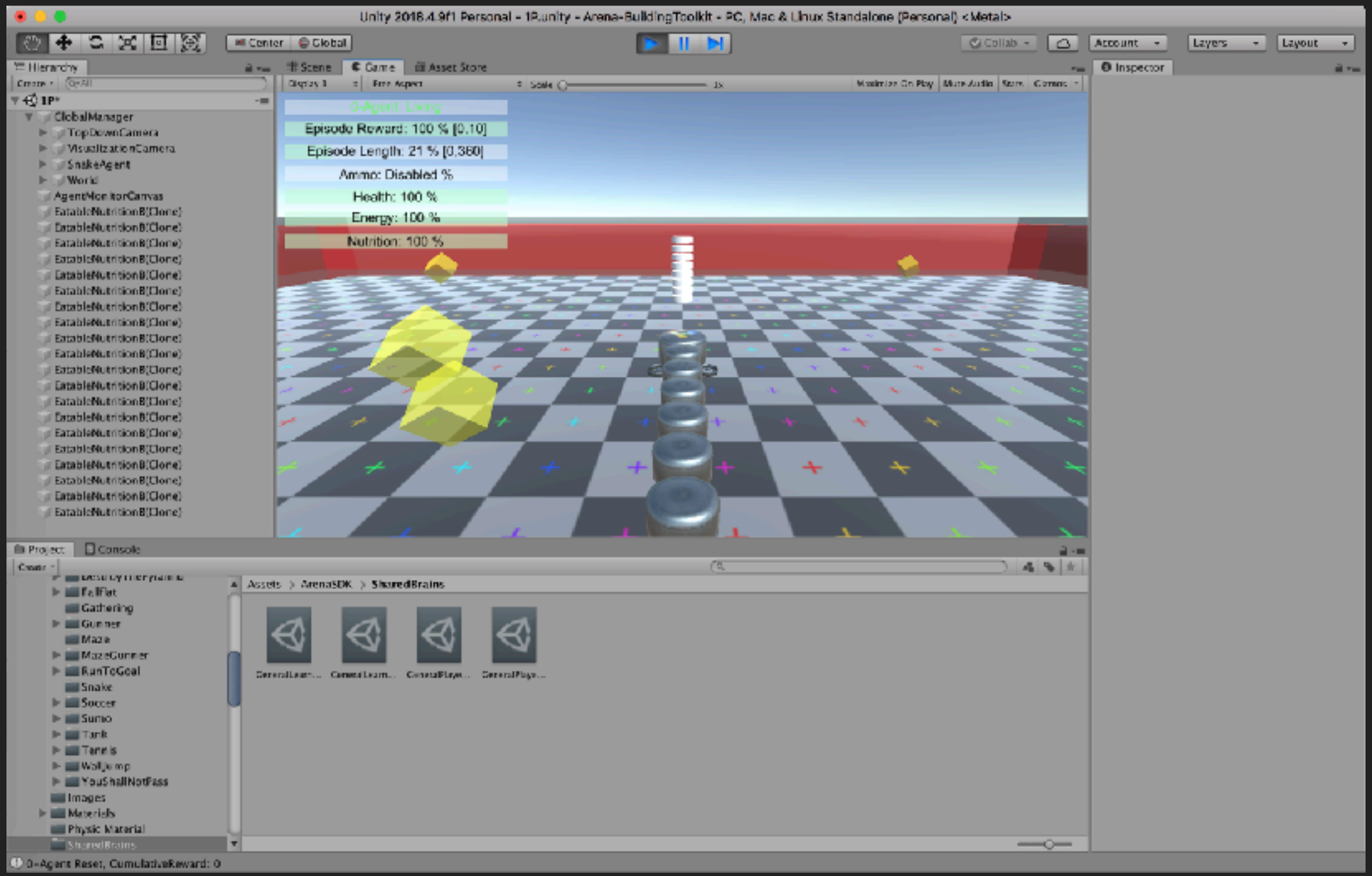

Assets
Scene
None
3DBallHardLearning
3DBallHardPlayer
3DBallHeuristic
3DBallLearning
3DBallPlayer
ArenaCrawlerLearnerContinu
ArenaCrawlerPlayerContinuc
ArenaWalkerLearnerContinu
ArenaWalkerPlayerContinuou
BananaLearning
BananaPlayer
BasicLearning
BasicPlayer
BigWallJumpLearning
BouncerLearning
None

USING IT?

SIMPLE GAME (NO BRAIN)



SIMPLE GAME (BRAIN)



CONCLUSIONS

- Very good software
- Designed for researchers with advanced knowledge about python, reinforcement learning and Unity
- It achieves its intended goal
- There should be more documentation
- We'd like a version in which learning models can be set easily for people like us.