

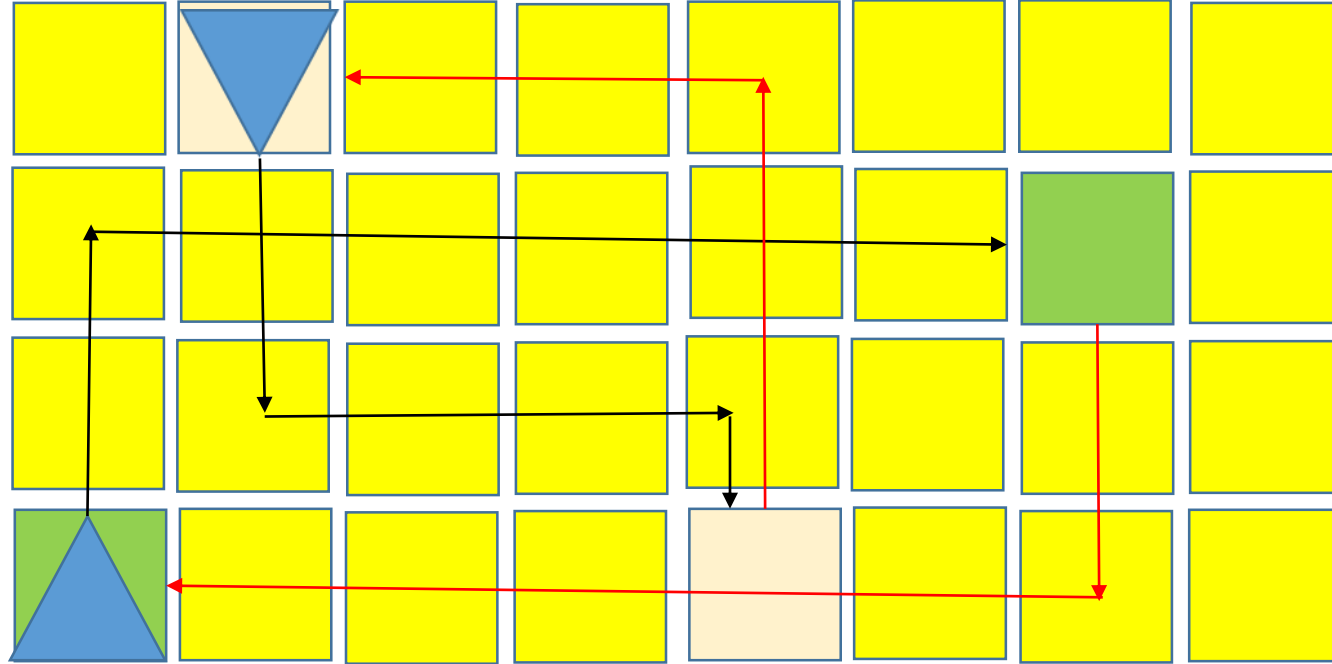
Robot-Walker

A simple example of a neural network development



Paolo Poli and Alessandro Zanetti

The goal



Each robot has to walk between the two assigned bases
avoiding crashes with other robots

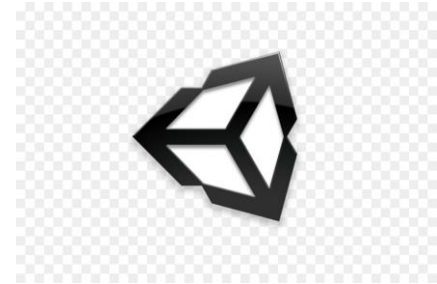
Programs and languages

- Python to develop the neural network

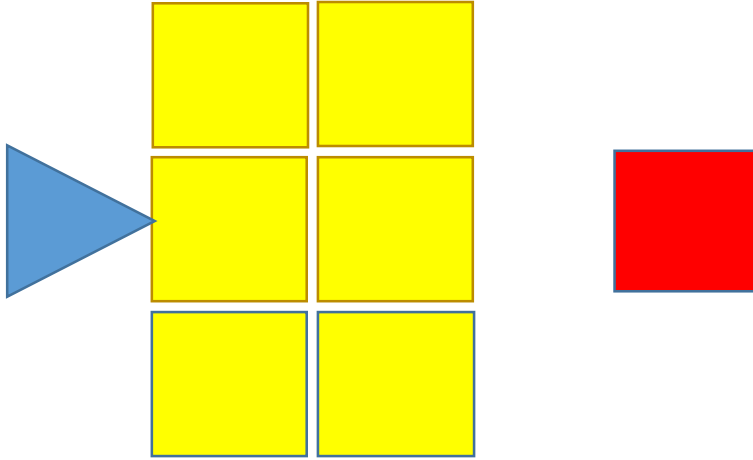


Programs and languages

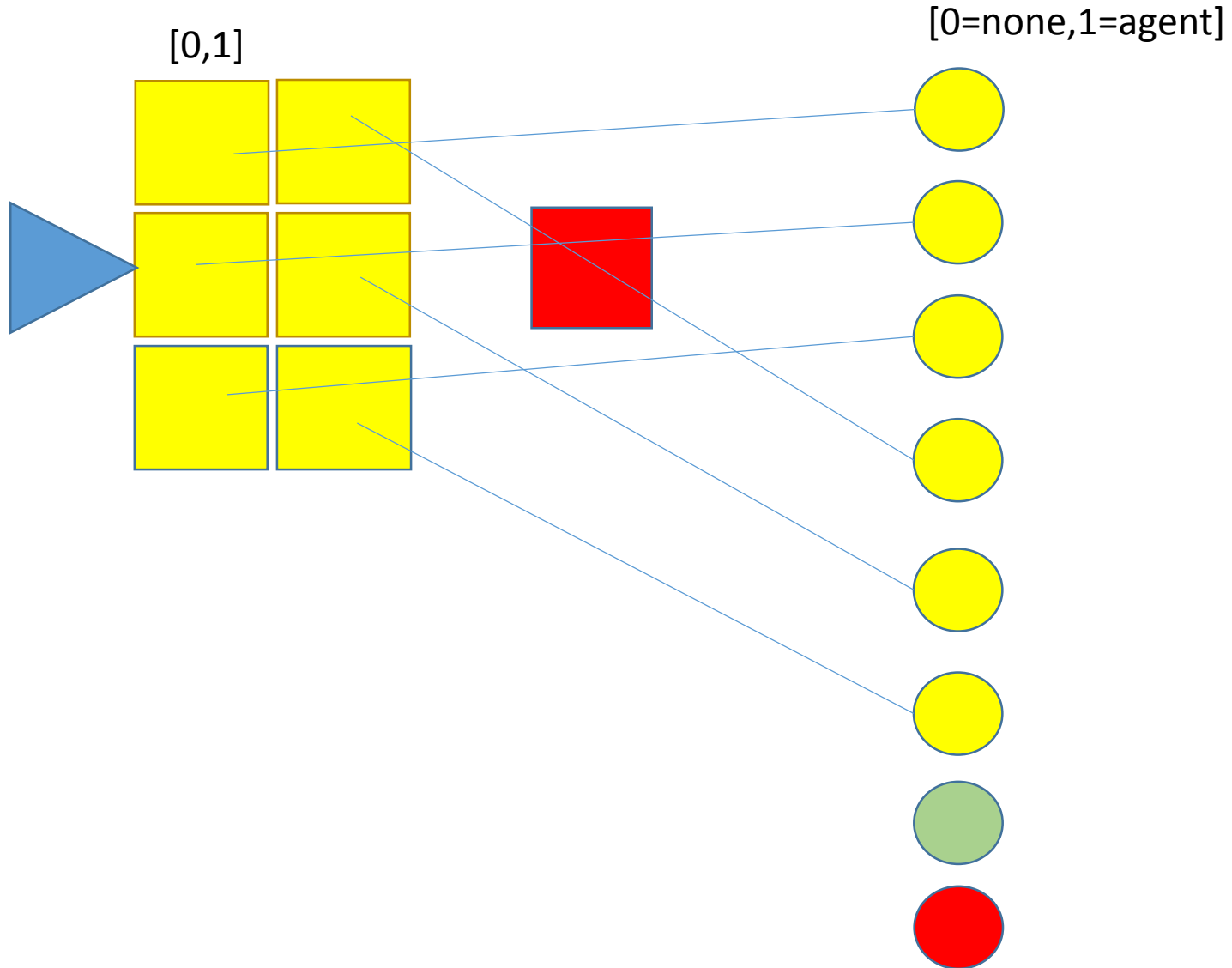
- Python to develop the neural network
- Unity 3D to show the dynamic of the simulation



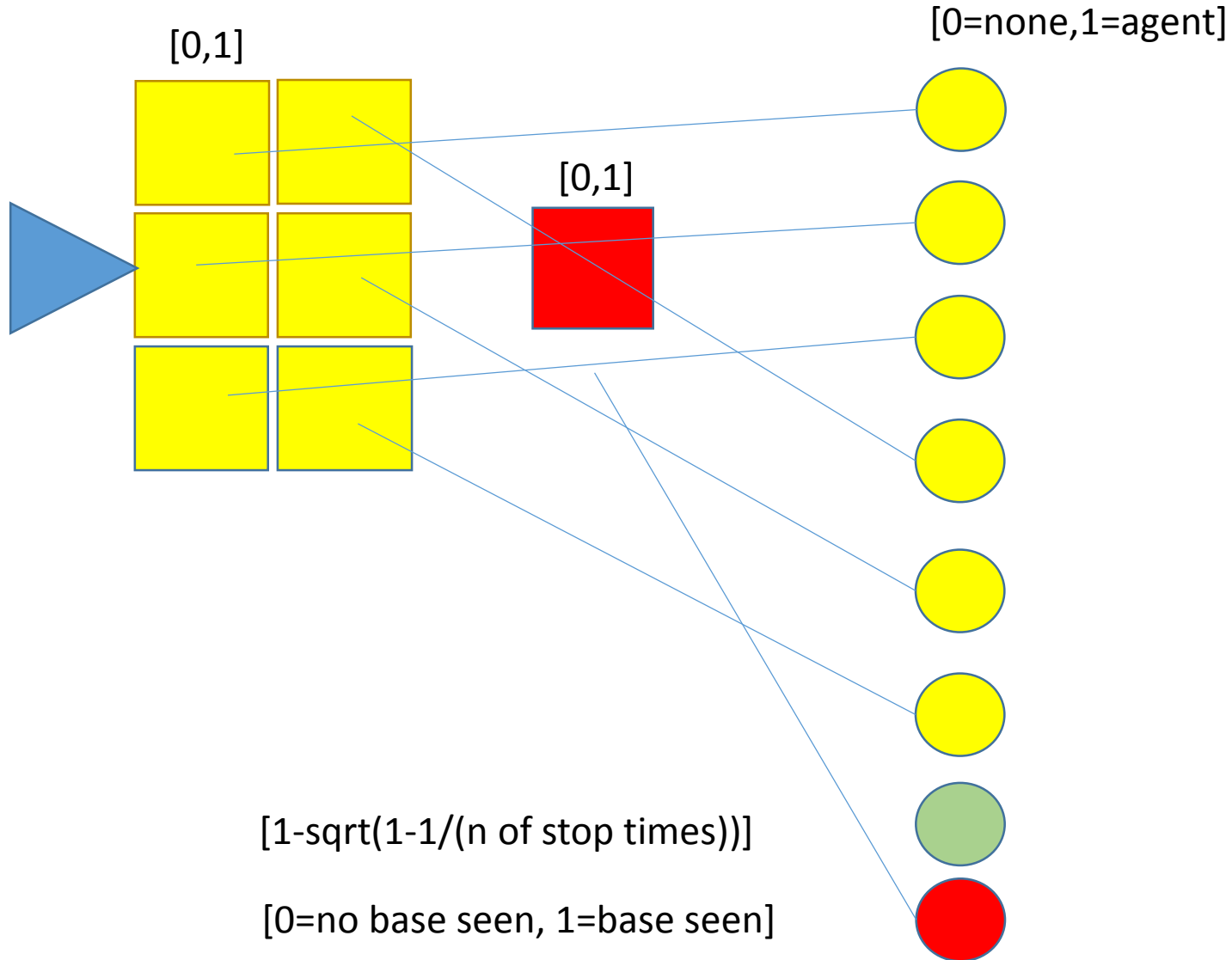
Neural Network



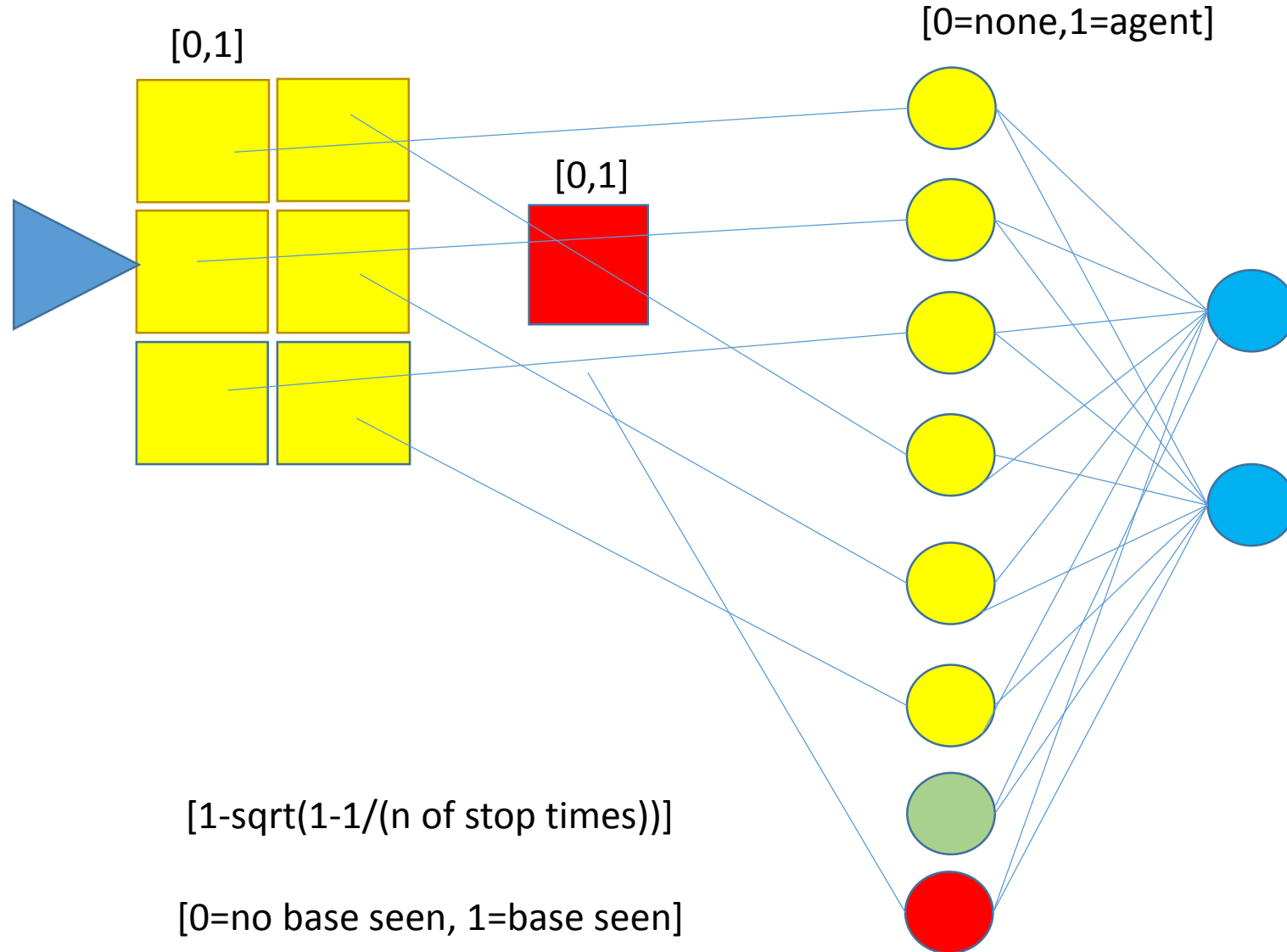
Neural Network



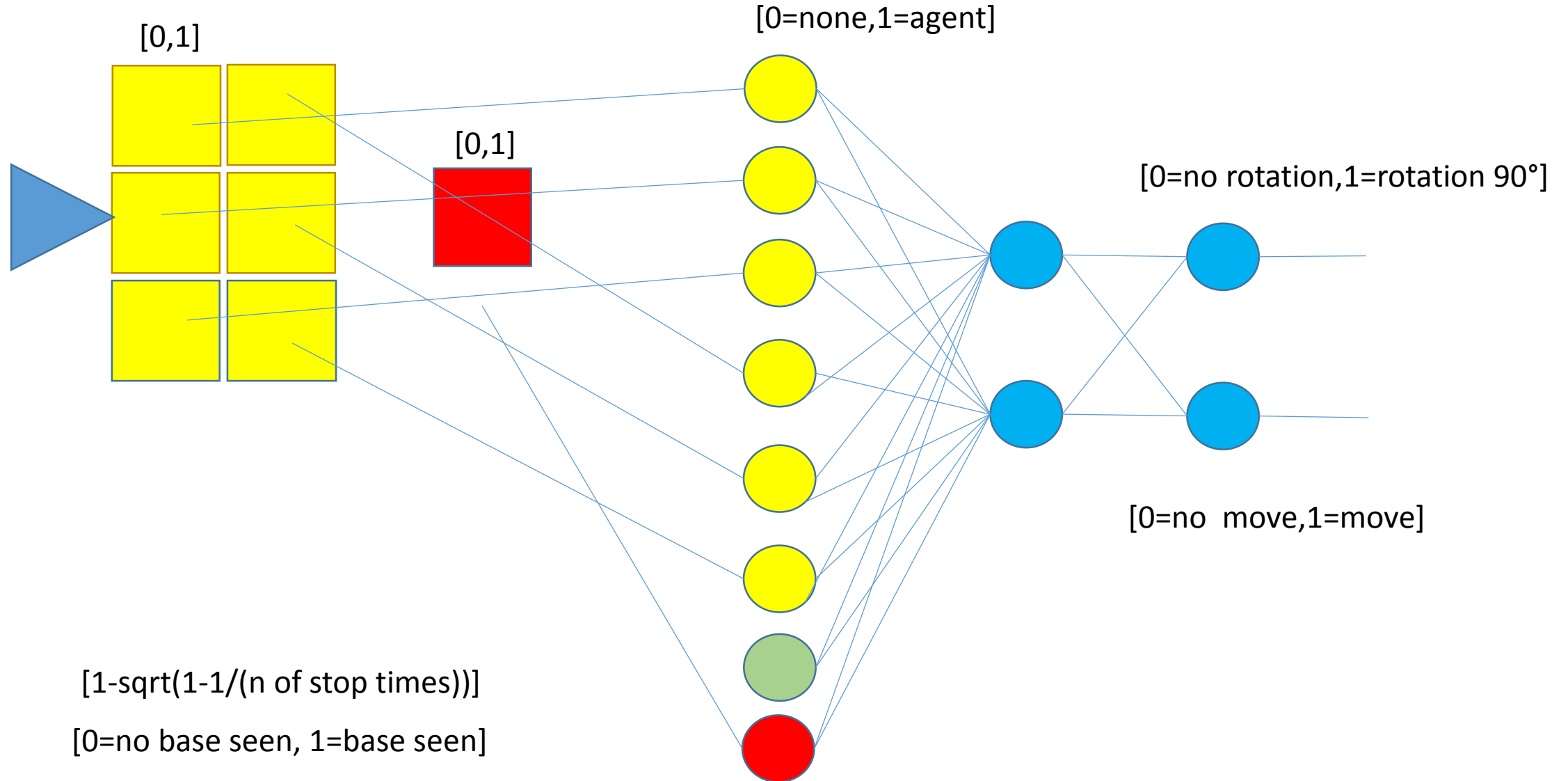
Neural Network



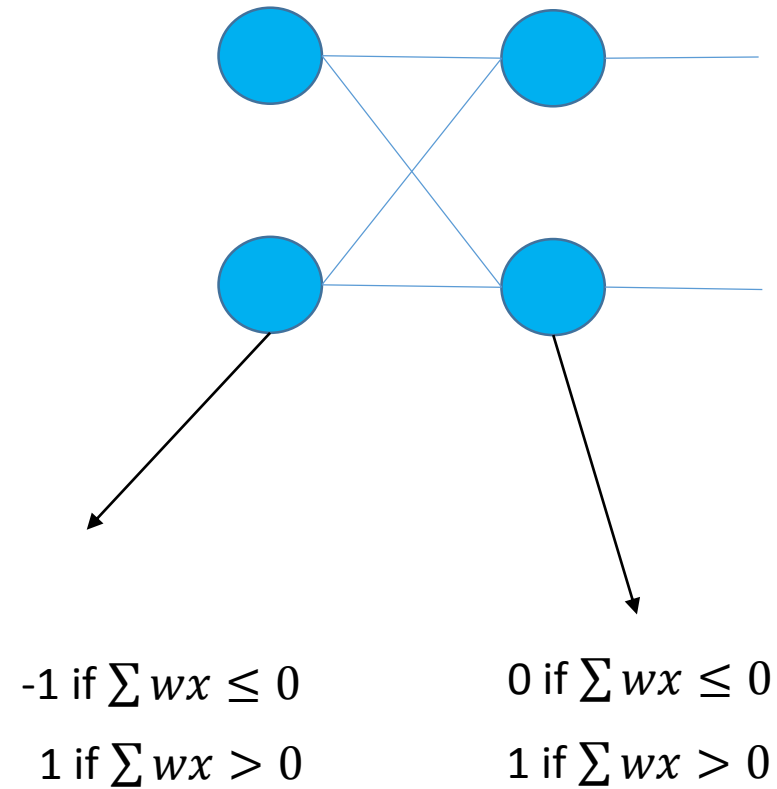
Neural Network



Neural Network



Activation functions



Total number of parameters= $14+4=18$

Neural network training

- Greedy method (it's not compulsory to use specific methods in ML literature)

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 - The training works increasing any value of the matrix of a random value between $-\omega$ and ω
 - The best performed matrix was chosen, any time the result was better of previously results
-

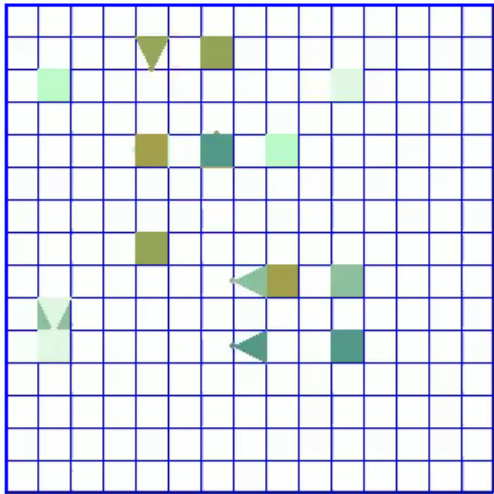
Cost function

The cost function chosen, is the sum of the number times each robot reaches one of the two assigned bases

Results

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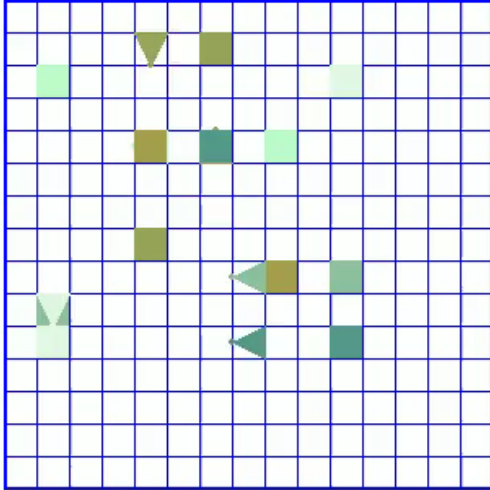
Untrained



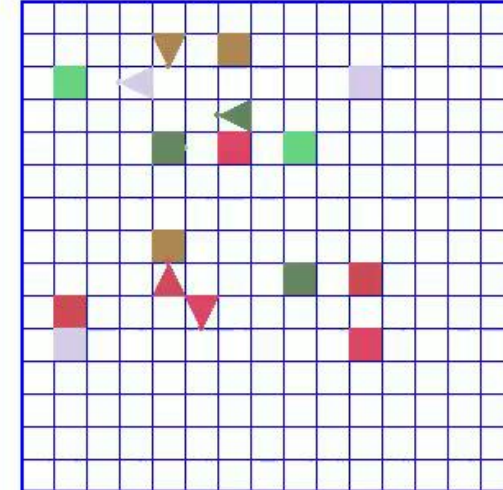
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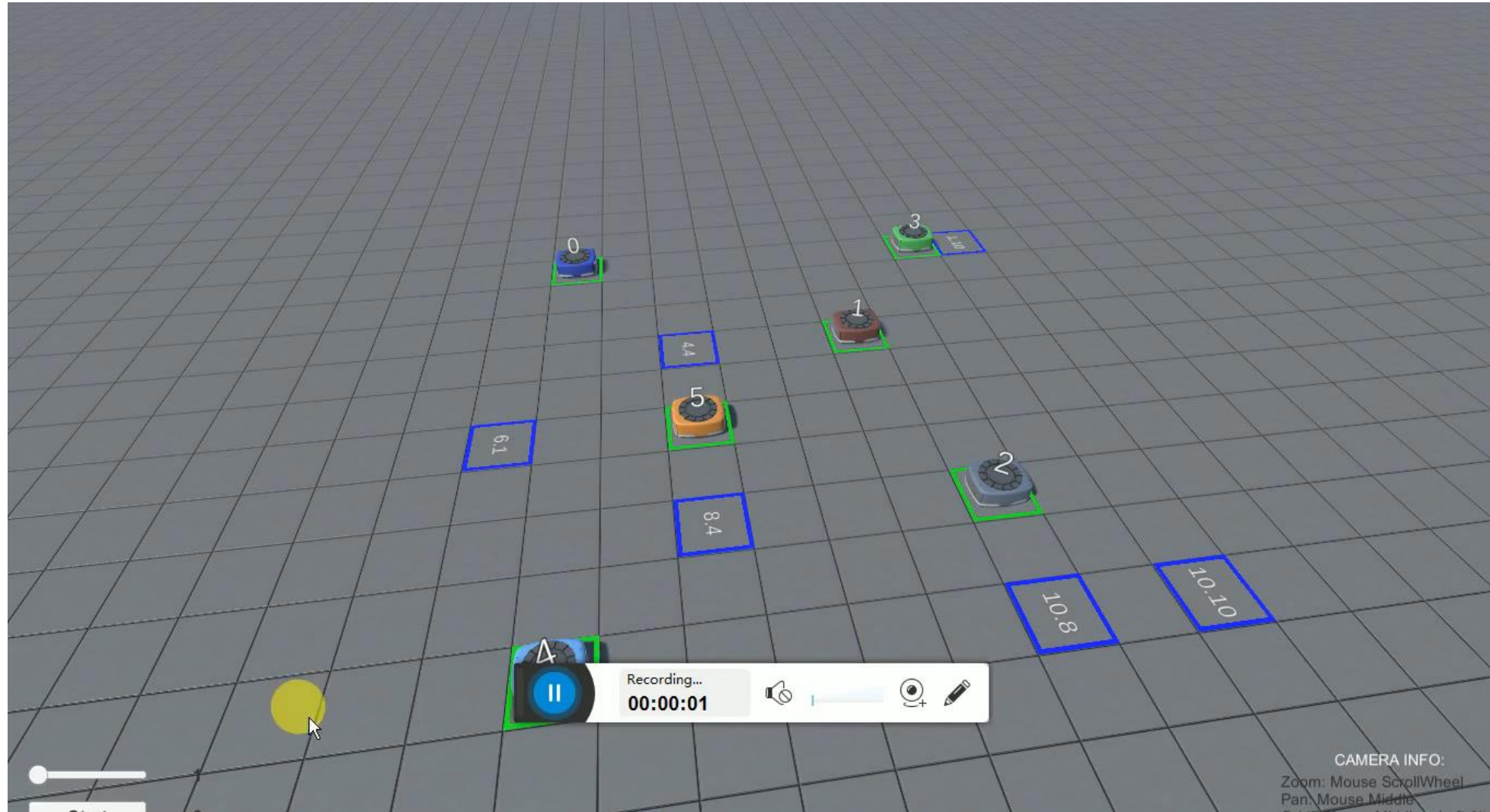
Untrained



trained



Results in Unity 3D



Conclusions

- An interesting example of problem where a simple neural network was coded has been shown
 - The goal was reached only by a simple laptop and with a normal home pc
 - New things can be added at the problem putting new goals at the problem
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Thanks!

Thanks everyone!
