DataLab Birds Angry Birds AI

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Abstract

The goal of the Angry Birds AI Competition is to build an intelligent agent that is able to autonomously play the Angry Birds game. There is no universal strategy for playing the game, respectively there is no basic strategy that would pass all the levels. Successful strategies for different levels are based on very different approaches. However, we believe that we are able to cover majority of levels with a relatively small set of strategies. We use a simple planning agent that decides which strategy to play for the current move considering the environment (blocks configuration, reachable targets), possible trajectories, the bird currently present on the sling and the birds available on the stage.

1 Agent

The agent always plans only one move. It simply decides about what move to take based on the estimated utility of each strategy. The strategy s^* with maximum utility is then played.

$$s^* = \arg\max_{s \in S} u(s),$$

where S is a set of available strategies.

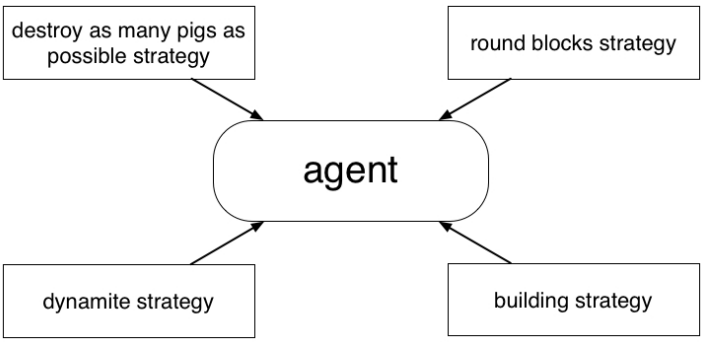

Figure 1: Playing agent.

2 Strategies

The goal of each strategy is to maximize the damage. Each of them is based on different idea that is suitable for different configuration. The strategies we propose are described bellow.

Dynamite strategy

Dynamite strategy tries to aim at the TNT only if there is a pig nearby. Its utility is greater if there are a lot of stones and other TNTs within a given range.

Building strategy

Building strategy finds a connected block structure near pigs. The block is considered suitable if it satisfies all of the following conditions:

- reachable,
- flat or straight,
- has at least two supporters,
- not high.

All the selected blocks are then sorted based on their type and relative position in the building. The best block for a given bird on sling is then selected. We also differentiate between three types of buildings:

- Pyramid
- Rectangle
- Skyscraper

Destroy as many pigs as possible strategy

Destroy as many pigs as possible strategy tries to find a trajectory with as many pigs in the way as possible.

Round blocks strategy

Round blocks strategy tries to hit a round block so that the moving block kills a pig. There is also an alternative of releasing the stone from a shelter which subsequently sets the killer round object in motion.

Tapping time

The tapping time is computed based on the first point the bird hits in the computed trajectory. It is different for every bird.

White bird

The white bird is moved above from the target object so long as it hits something in the trajectory. Then the bird's egg is released from above so that it hits the desired target object.

3 Trajectories & trajectory utilities

All strategies store the planned trajectories in a *Trajectory component*, which computes the utility of the trajectory with a formula below:

$$trajectoryUtility = \sum_{l \in B} \left(\frac{d(t,l)^{1.4}}{\alpha} + 1 \right) * u(r,l), \quad (1)$$

where B is a set of game blocks l in the planned trajectory, $d(t,l)$ is a distance between the target object t and a block in the way, α is a normalization constant, $u(r,l)$ is a function, which returns utility based on a bird r and a type of a game block in the way.

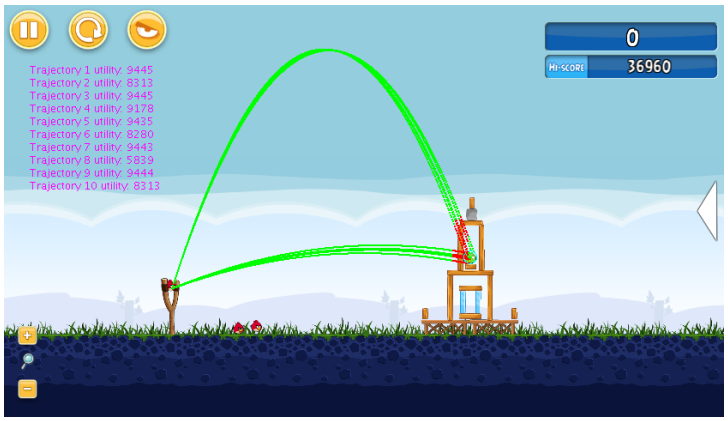

Figure 2: Planned trajectories, trajectory utilities colored magenta.

Game playing addition

We improved the trajectory planning which now works with more release angles and respective velocities. Our agent uses only fastshoots as we are able to deduce from the screenshot if anything moves in the scene. We've implemented new methods which can easily tell the relative position of a block towards other blocks and also if two blocks touch.