Angry Plan A+ Team – Team Description Paper

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1. Multiple Strategies

Initially, we designed a strategy with very small randomness but it fails to clear unexpected stages with several runs. Therefore, we propose to use multiple strategies with different strategic approaches. When it runs first, it uses the first strategy for all stages. If there are stages not cleared from the first trial, we attempt to solve them using the second strategy. It applies the two strategies by turns until there is no remaining unsolved stage.

1.1 The First Strategy

In this strategy, all pigs and TNT can be candidates as a target. For each time to shoot, it generates multiple trajectories (maximum two for each target) and counts the number of objects (stone, wood, and ice) to be broken by the bird on the sling. In fact, it's not easy to predict the number accurately before it shoots. To calculate the outcome, a simple heuristic is adopted. In this work, "physical strength" of birds and objects are defined. The value is set differently based on their types. The initial "strength" of bird is recalculated if it hits an object on the trajectory. It subtracts strength of the object from the bird's one. It continues the subtraction until the object's strength is bigger than the bird's remaining power.

For example, if the strength of bird, stone and wood are 100, 40 and 20, respectively and there are four objects, two stones and two woods, in sequence, it's possible to guess that it can break the two stones and one wood in the trajectory. Although it's simple, it can be used to guess the outcome roughly.

Because each trajectory has different number of objects, it is necessary to normalize the estimated value. It simply divides the number by the total number of objects in the trajectory. For all trajectories, it selects the one with the highest normalized outcome values.

1.2 The Second Strategy

It's the same that it also consider all possible trajectories (maximum two for each target). However, it uses different scoring method to select the best trajectory. In the calculation, it counts the number of pixels crossing between the trajectory and the object.

2. Optimization

It's not trivial to set the parameter values for the two strategies. Initially, our team members spend much time to find good parameters for the two strategies. After then, a simple greedy-style optimization is applied to the human's solution. In the parameter tuning, the most difficult to problem is to minimization of evaluation time for each solution. Because it has no way to accelerate the speed of Angry Birds game, it requires one ~ three minutes to get score for each stage. If we assume to test on ten stages, it takes about ten ~ thirty minutes for just one solution.

To speed up the optimization, we decided to use multiple machines in parallel. Figure 1 shows the client-server architecture for our proposal. In the setting, each client is in charge of one stage assigned from the server. In the evaluation, we select 20 stages to test and use them for 20 machines in parallel (Figure 2).

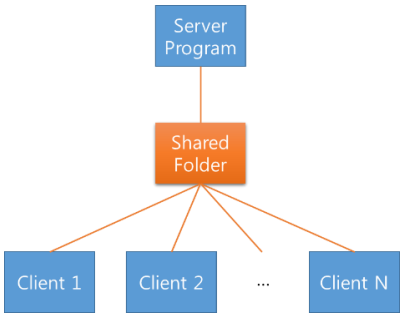

Figure 1. The client-server architecture for parallel running of Angry Birds games

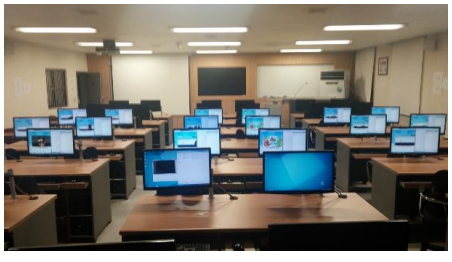

Figure 2. Running multiple machines to reduce time for evaluation