# Phoenix(Angry Birds AI agent)


## Abstract

The task of the Angry Birds game is to kill the pigs protected by a structure composed of different building blocks that observe the laws of physics. The structure can be destroyed by shooting the angry birds at it. The fewer birds we use and the more blocks we destroy, the higher is the score. An approach to solve the game is by analyzing the structure and identifying its strength and weaknesses. This can then be used to decide where to hit the structure with the birds. This paper presents an efficient way of playing the first 21 levels of poached eggs game in angry birds. It takes into account all the factors present in the angry birds environment and strategically makes the agent play the game and obtain an efficient score.


## Introduction

In this game, birds are shot to attack pigs that are protected by blocks of ice, woods and stones. The objects in the Angry Birds game can be divided into two categories. Birds, pigs, woods, stones, ice are dynamic objects, while slingshot, ground and hills are static. Each level consists of a playing field, containing structures of wood, ice, stones as well as one or more pigs. To complete a level, one is required to destroy all the pigs by shooting a limited number of birds. Birds are shot via a slingshot and come in different colors and sizes, indicating special bird features. In this game, we are limited to red birds, which have no special features; blue birds, which divide into a set of three birds when the player taps the screen; yellow birds, which accelerate upon taps. Our experiments involve Levels 1-21, which do not have any TNTs nor white or black birds.

Playing Angry Birds requires making four choices:

Target Point: The point to be shot by the bird present of the slingshot.

Release Point: The point from where the bird is released after being pulled up by the sling.

Shot Angle: The release angle of the bird being shot.Our algorithm has different kinds of shots angles as high and low depending upon the path between target and release point.

Shot Strength: How far the bird is pulled back in the slingshot. There are two different kinds of shots-high and low depending upon the trajectory between the release point and the target point.

Tap Time: When the game's screen is "tapped" when a human plays, the behavior of the flying bird changes.In the similar way,AI agent computes the tap times of birds by an algorithm.

## Strategy

Basically, our strategy is divided into three steps:
1. Deciding the target point:

We determine the target point by creating analysis.java file which provides a cluster based strategy in which we identify the "**clusters**" of all the blocks(ice, stone,wood) and determine the cluster which contains the maximum no. Of pigs. We, then find the weak point in that cluster which is the center of the cluster and target it. In, the absence of pigs in any of the clusters , we resort to targeting the first pig in the list of pigs. In the case of yellow birds, using trial and errors we found that the above strategy was incompetent and hence, we employed an equation involving a factor depending on x-y coordinates of all the pigs and we targeted the pig with the maximum value of that factor.

2.Deciding the angle:

The trajectory planner returns a maximum of two trajectories for a given set of release point and target point. We choose the trajectory to shoot using the method given in utils.java ,i.e, isReachable() which determines whether the target is reachable using that trajectory without obstacles blocking it's way. If both the trajectories turn out to be unreachable, we randomly choose between the higher and the lower angle with a probability of half.

3. Deciding the Tap Time:

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For the Yellow and Blue Birds, we determine the tap time using a function called findTapInterval which compares the x coordinate of target point and the blocks to find the ones in between the trajectory and accordingly, set the tap interval of the bird.

### Conclusion

In this paper, we focus on making the artificially intelligent agent play the Angry Birds game efficiently by implementing the strategies based on the physical structures present in the game environment, analysing the target points, trajectories and finally shooting such that it clears the level and causes maximum possible destruction to attain high scores.

## Scores

**Total: 981740**

Level 1: 33610
Level 2: 60480
Level 3: 41290
Level 4: 28980
Level 5: 67110
Level 6: 25980
Level 7: 30110
Level 8: 49570
Level 9: 49900
Level 10: 53370
Level 11: 58390
Levle 12: 58410
Level 13: 51330
Level 14: 65640
Level 15: 31230
Level 16: 51140
Level 17: 42270
Level 18: 51080
Level 19: 32110
Level 20: 36150
Level 21: 63590