

# Hungry Birds

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## 1 Introduction

Angry birds is not an easy game. In this game, our final target object is pigs. However, The structure of objects makes it difficult to access them. In this situation, although it is a simple method, the sample AI-naïve agent- performed efficiently. From our observation, the destruction of the structure can produce high-level scores. So, we have built an agent focused on the structure destruction.

## 2 Main idea

Generally, in each level, the game provides fewer number of birds than pigs. This situation needs attacks with falling blocks. How do we make more falling blocks? We thought that if we strike on the weakness of structures, it will make more falling blocks. So we tried to find the weakness of structures (Figure 1).

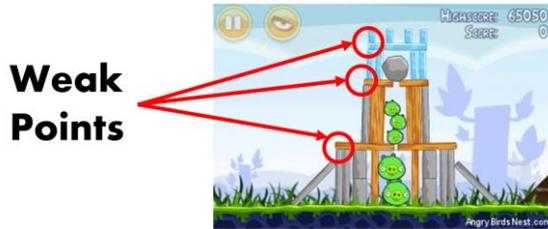


Figure 1. Weak points of a structure

### 2.1 Weakness of structures

We defined components of weakness such as surface weakness, potential weakness, isEdge and isOverweight. Each bird has a special feature: Yellow birds can destroy wood blocks better than blue birds. Like this, surface weakness is depending on a throwing bird (Table 1). Potential weakness means thickness of obstructed blocks. IsEdge and isOverweight are binary variables. We also consider the edge of structure and structure overweighted as weak points.

Finally, we estimate weakness of structures using following formula.

$$Weakness(i) = \frac{1}{Count_i} * weak_i * 0.9 + weak_{p_i} * 0.1 + 0.5 * isEdge_i (if y_{axis}) + 0.2 * isOverweight_i$$

	Red	Blue	Yellow	White	Black
Wood	0.8	0.8	0.4	0.8	0.4
Ice	0.8	0.4	0.8	0.8	0.4
Stone	0.2	0.1	0.1	0.8	0.8

Table 1. Weakness by bird types.

### 2.2 Impact of birds

Now, we can destroy structures easily. However, sometimes, this approach strikes useless blocks regardless of pig's position. Because of this problem, we added an impact function to consider the pig's positions.

When a bird strikes some objects, the bird's power forces objects to move following the birds's ongoing direction (Figure 2). It means that we can estimate the damage of pigs. Following formula estimates the impact value.

$$Impact(\overrightarrow{Point_{arrival}}) = \frac{\sum_{i=0}^{pigs} \frac{Angle_{arrival} \cdot \widehat{Pig}}{\|Pig\|}}{Count\_of\_pigs\_in\_range \times Total\_pigs}$$

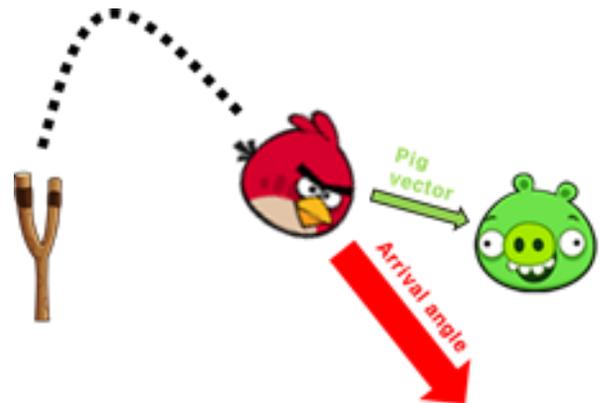


Figure 2. Description of an impact function

### **2.3 Weakness value**

Now we can get weakness of structures and impact of birds. In this situation, one of important thing is weight. We decided weight value through several repetitive experiments. Following fomula is final weakness function

$$\text{Final weakness} = \text{weakness}_{\text{structure}} + 25 * \text{Impact}_{\text{bird}}$$

### **3 Shoot!**

Shoot a bird to most weak point of structures.