

Discovering Unique Game Variants

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Introduction

In here, the big aim is to make various version of game, and classify these game into some groups.

There are two main steps.

1. Searching various version in a same game space.
2. Classifying games into groups.

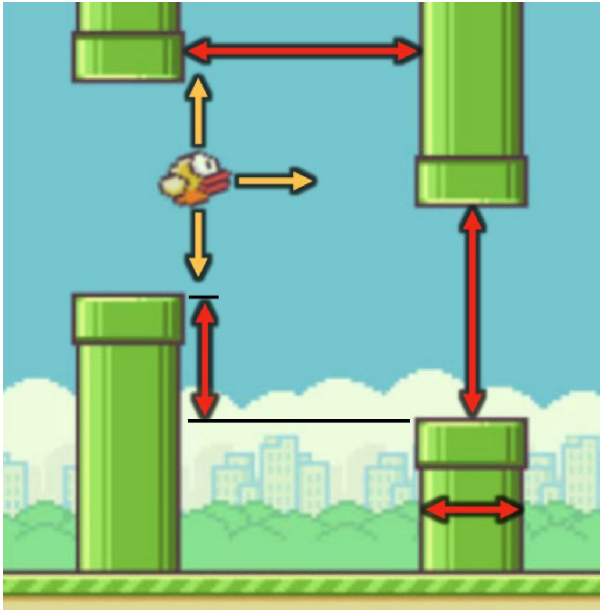
Flappy Bird is used for research.



Step 1: Searching various version

Step1. Searching various version

For searching various version, they change parameter of game space in this research.



In Flappy Bird, parameter is:

- length / height of pipe
- distance between each pipe
- size of birds
- shape of birds
- speed of birds
- etc...

figure2: The parameters in Flappy Bird

Step1. Searching various version

○How to search?

1. MonteCarlo Simulation

The way to predict probable result of uncertain phenomena.

2. Survival Analysis

The analysis for investigate the factor that affected by an action.

Step1. Searching various version

○Precondition

1. Can be played by human (not so difficult)

If the game is too difficult to play for many people, no one play it.

2. Play time (not so longer)

If the player spend 1 year for only 1 point, these game is boring.

For achieving these precondition, using AI player model that can adjust level of skill.

Step1. Searching various version

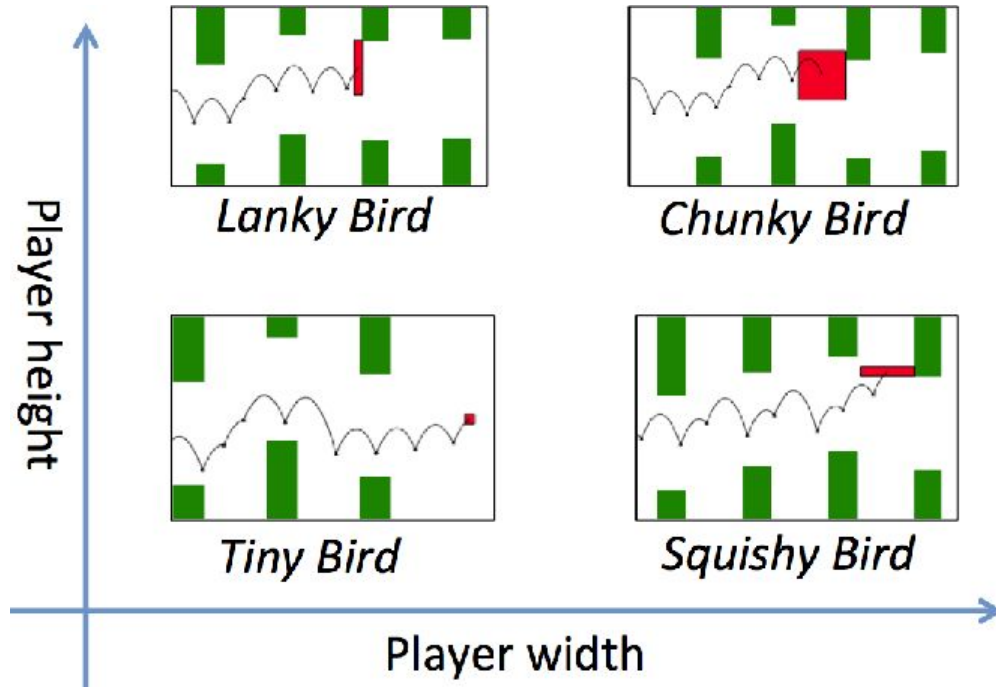


figure3: the difference by adjusting size of bird.

Step1. Searching various version

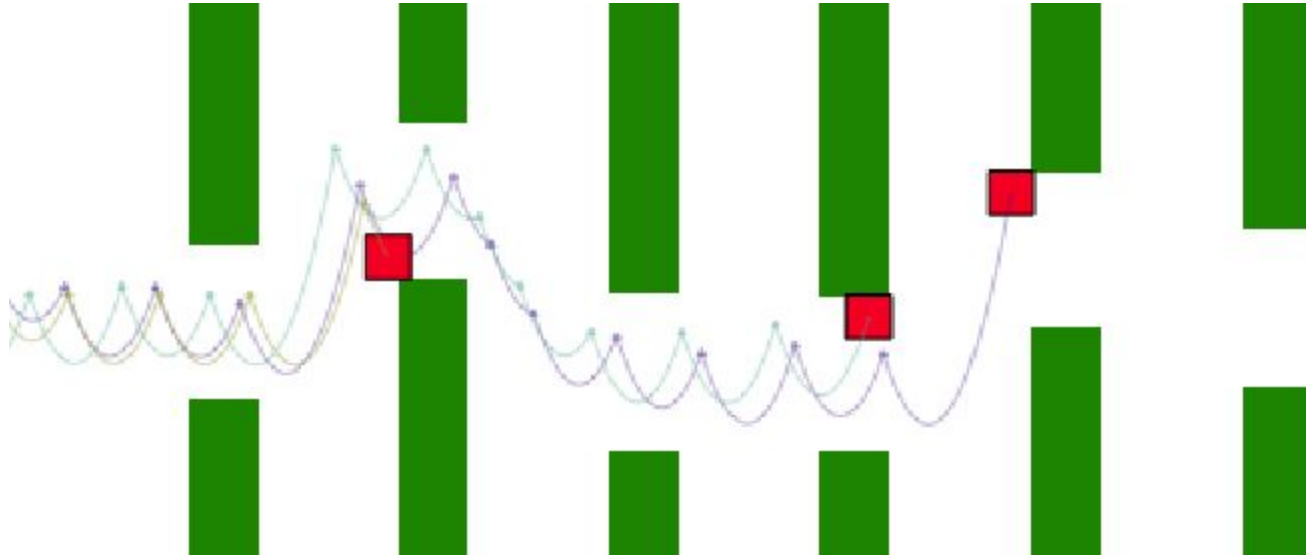


figure4: Diver Duck (changed way of gravity)

Step2. Classifying games

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○ How to classify games?

- By using k-clustering.

- K-clustering is the way of classifying data.
- With using k-clustering, it classifies data into random cluster, then adjust each cluster equally.
- As a result, the number of cluster is k.
(If $k = 5$, the number of cluster will be 5)

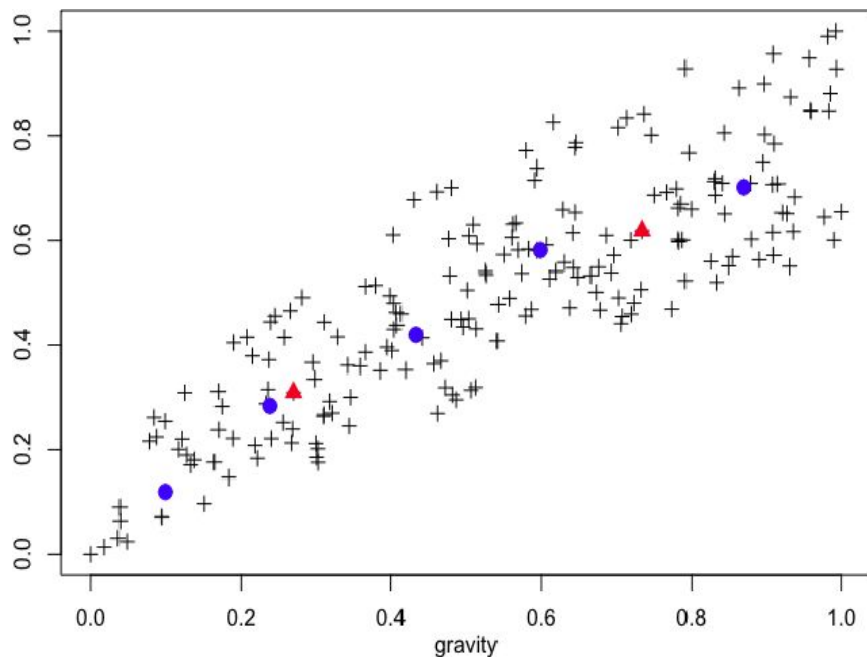
Step2. Classifying games

○ Things that need before k-clustering.

1. Decide the value of k.
 - 1.1. Using pamk function of R language.
 - 1.2. Clustering many times, and use the optimal value.
2. Normalize parameter space.
 - 2.1. For comparing correctly, each parameter have to be normalized from 0 to 1.

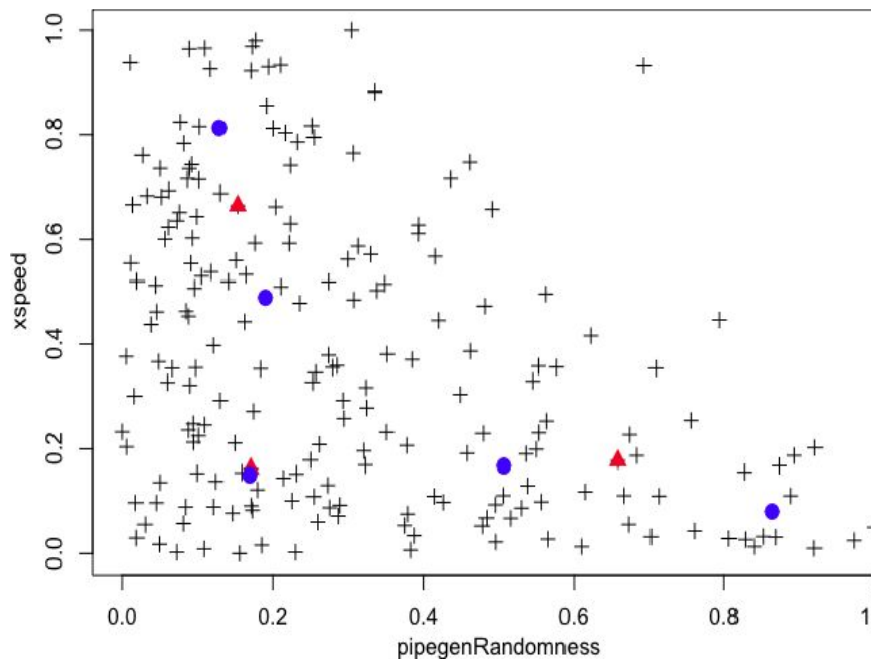
Step2. Classifying games

1. Clustering into some group



●: when $k = 5$

▲: when k is optimal

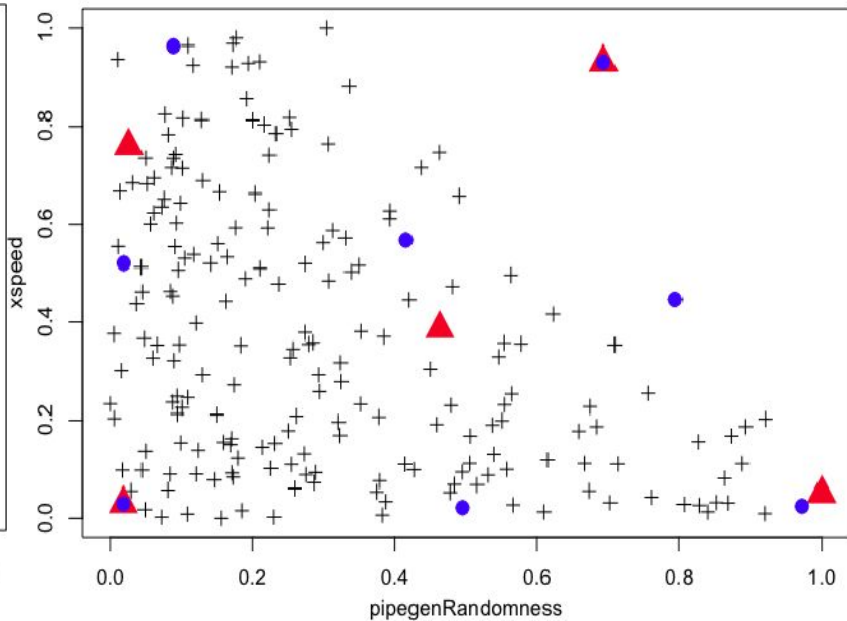
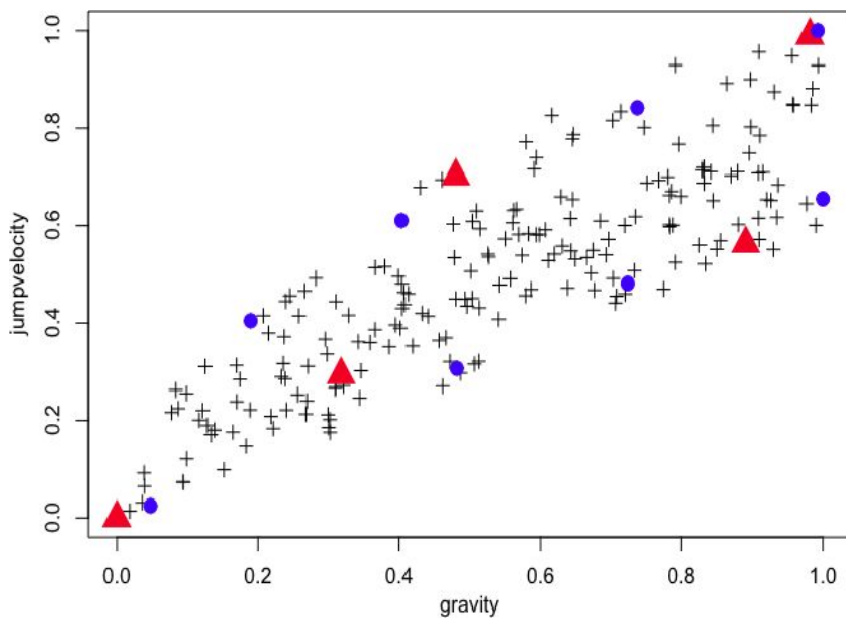


Step2. Classifying games

2. Clustering into the most unique groups.

●: when $k = 8$

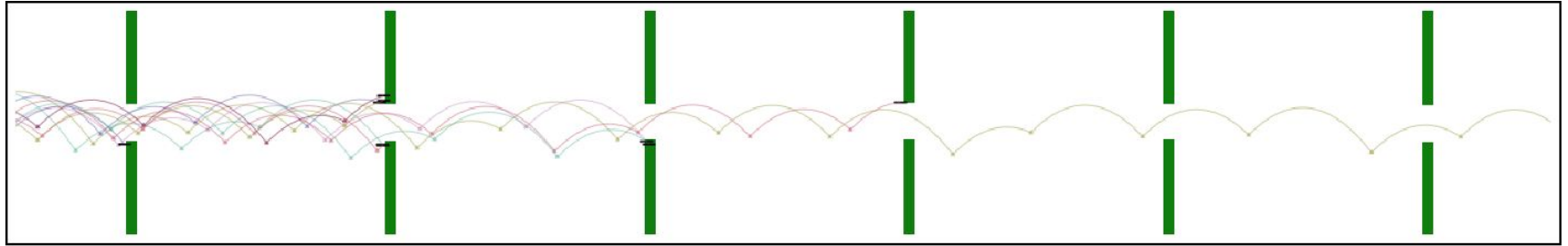
▲: when $k = 5$



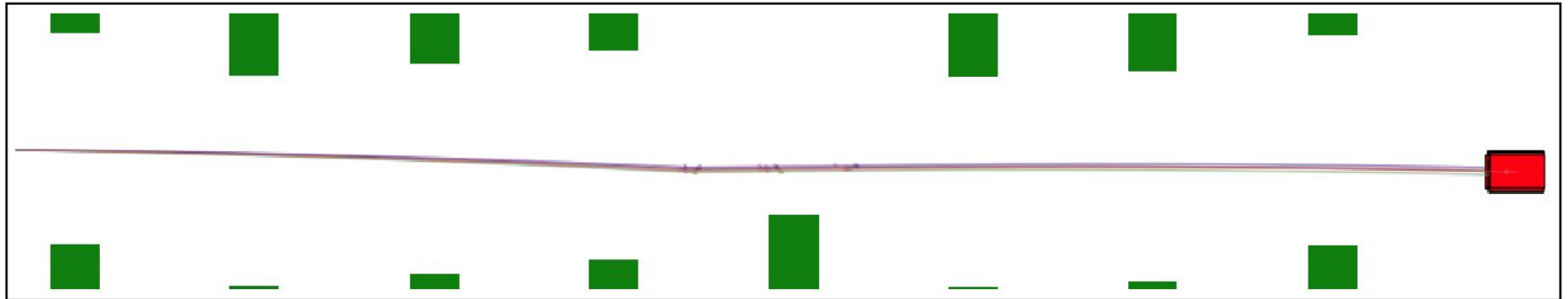
Result

Result

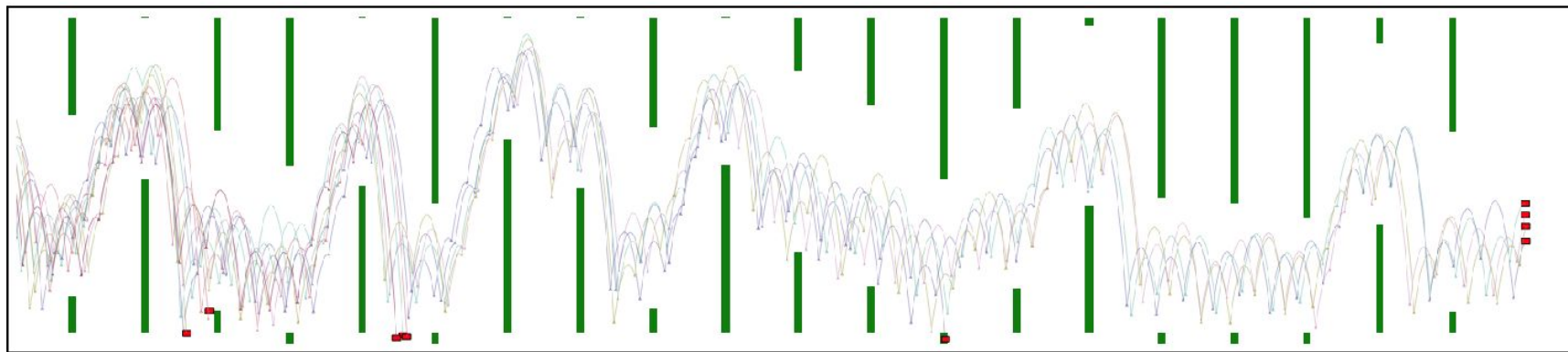
By using these methods, they can find 4 variation:



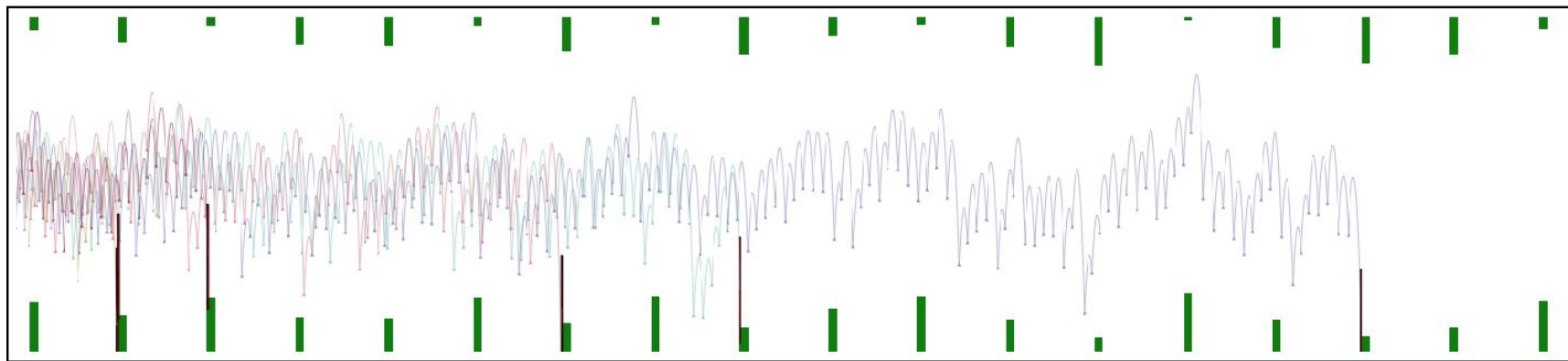
Needle Gnat



Lazy Blimp



Droppy Brick



Pogo Pigeon

Comments

- I think this method is very convenient for making game better. By using this method, we can adjust game difficulty easier, and also we can make another version with low cost.
- But Flappy Bird is simple game. In the case of more sophisticated game, maybe these method will not work.