IT-326 Artificial Intelligence
Angry Birds - Finishers
Submission-6

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***Abstract*—In this submission we are mainly going to concentrate on the revised strategies as suggested in previous submissions. Firstly, we discuss the algorithm to determine the weak points or weak blocks of the structure. Secondly, we will discuss about how to use the weak points/blocks of the structure and determine the angles of projection to be used so that it can produce maximum destruction to the structure using Expectimax.**

***Keywords*—**

I. Introduction

We had come up with a new Strategy that uses weak points and guessing the future state from present.

- Finding weak points in a structure.
- Expecting Future State using potential Functions.

A. Finding weak points in a sub-structure

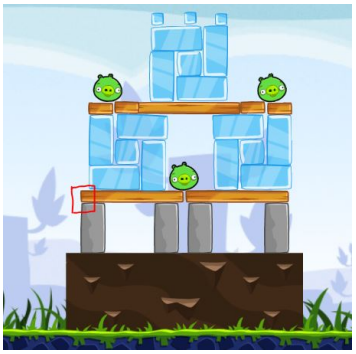
A sub-strucutre is a set of objects which are connected to each other. We divide the whole structure into set of sub-structures.

In before stategies we were hitting only the weak points but later we realised that if a weak point is far away from a pig then there is no significance in chosing that weak point. For that we divided the whole structure into sub-structures and targeted the weak points in only that particular sub-structure which had maximum number of pigs. This is how we came up with the idea of sub-structures.

B. Finding Weak Points in a structure

We have implemented a routine known as weakPoints in the NaiveAgent class. This routine returns an ArrayList of all those points which are considered to be weak according to some assumptions which we have take which are as follows :

- The blocks which are open to air i.e the blocks at the top most height. They are considered as weak points because in some cases there is no other choice than destroying the structure from top to bottom.
- The Blocks which are easily approachable are considered to weak as they are easily approachable. Such blocks are being identified by determining the top-left and bottom left corners of a particular block and those blocks with least possible top-left.x are selected in a Densely populated subStructure.
- We consider those points where the blocks are like vertical to top and horizontal below it(glass or stone) and and a vertical block below it and we take the centre of the left side of the rectangle and hit there if there are any pigs above the middle block or immidiate right of sunStructure as the jerk can give make the pigs to move and can lead to fast finishing of the game.Example the red marked square will be the weak point as we said before.



C. Expecting Future State using potential functions

we Intially know the present state i.e the postions of the pigs and objects we assign some potential values for the object to break with respective its size and we take potential values(i.e Streanght) of all the birds as 1000 and and Intially create a table as shown below indicating the potentials required to break the object by the bird.

Look up for birds on Object:

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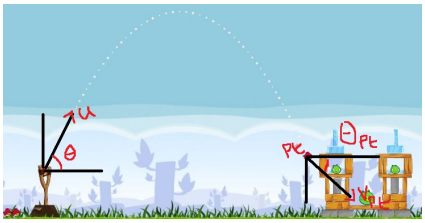
Blocks	Red	Blue	Yellow	Blue
Glass	650	750	200	500
Wood	800	750	250	500
Stone	1050	1000	1000	500

TABLE I. POTENTIALS REQUIRED BY BIRDS TO BREAK THE OBJECT



we update this tabel accourding to the changes that are happend and the values that we have Initially assigned and the actual result that had happend.This is a Learning streatagy that our Agent can do it using MDP.

- we create set of all angles i.e center of mass of all the blocks ,c.m of pigs, all compalsory hit of pig , weak points if any and order them in decresing order of hits in the set.

$$\{\theta_{Angles}\} = \{\theta_{objs.C.M}\} \cup \{\theta_{Hit}\} \cup \{wkPts\} \cup \{pigs.C.M\}$$

- Initial potential value of the structure includes the potentials of number of pigs in the state and number of blocks in the space.So, the Initila potential value of the state at start is:

$$\Phi_{initial} = \Phi_0$$

$$\Phi_0 = 1000 * NoOfPigs + 1000 * NoOfBlocks$$

$$\Phi_1 = \Phi_0 - \Phi destruction.1$$

$$\Phi_2 = \Phi_1 - \Phi destruction.2$$

$$\vdots$$

$$\Phi_n = \Phi_{n-1} - \Phi destruction.n$$

So our main Aim here to maximize the decrease in the potential from first to last state i.e the difference in the potentials of final and Initial state.

- Inorder to get this we want to estimate the destructin happened in the structure so we require the kimnemarics underlying inside so we created some formulaes i.e the velocity the bird hit the block and angle at the collision and force due to the moment this will help us in getting the destructionPotentials in that state

$$V_{pt}^2 = u^2 - 2 * u * g * t * sin(\theta) - (gt)^2$$

fource Acting on the first hit on the block is givebelow:

$$F = \frac{2 * m_bird * cos(\theta_{pt})}{\Delta t}$$

we use the force ,Momentum and determine potential lost using the look up tabel as described before and expet the next state and try to maximize the score(Utility) using A*.

Some text for the appendix.