2023

AIWars: Conquer the Battlefield

Hosted By:
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AI Club, IIT Dharwad

INTRODUCTION

Have you guys played the game “Dots and Boxes”? We are here to have your old memories refreshed. Oh No! Haven’t played the game??? Or maybe you are not familiar with the name?? Do not worry! Let us have a look on what the game exactly is:

Dots and Boxes is a pencil-and-paper game for two players (sometimes more). The game starts with an empty grid of dots. Usually two players take turns adding a single horizontal or vertical line between two unjoined adjacent dots. A player who completes the fourth side of a 1×1 box earns one point and takes another turn. A point is typically recorded by placing a mark that identifies the player in the box, such as an initial. The game ends when no more lines can be placed. The winner is the player with the most points. The board may be of any size grid.
You can have a look at the following video for more clarity:
https://www.youtube.com/watch?v=FLNPAKBJavY

There are several strategies that can help you perform better than your opponent in the game. You are free to go through various strategies of winning the game that will help you in the problem statement.

STATEMENT Problem

Task: Given an environment, your aim is to train your bot such that it wins over its opponents by conquering more squares(1 x 1) in the grid.

So, your task is to design a heuristic that takes into account your opponents' moves and plan its move accordingly so as to maximize the number of squares that it captures at the end of each game.

STATEMENT

Problem

You are expected to submit a function with the following description:

Input Parameters:

- ‘N’ of int data type which is the dimension of the N x N grid
- list(tuples) where the length of each tuple is 4. The list denotes the edges that have been occupied till now. It will be an empty list at the start of the game. Each occupied edge is represented as a tuple of length 4 with (x1,y1,x2,y2) format. x1,y1 are the coordinates of the first vertex and x2,y2 are the coordinates for the second vertex.

What will your function return?

- A tuple of length 4 with (x1,y1,x2,y2) format. This tuple denotes the edges that your function places according to the situation of the grid during any function call.

STATEMENT

Problem

Note: Remember to return a valid tuple. The length of your edge can only be 1. If your function returns an invalid edge, it will lead to disqualification.
Eg: (1,1,2,1) is a valid edge. However, (1,1,2,3) is an invalid edge.

Programming Language: Python

Team Size: 2 - 3 members

Submission Deadline: 16 June, 11:59 PM

Report

A report containing the following needs to be submitted along with your code:

1. Your understanding of the environment (in brief).
2. The heuristics that you explored.
3. The heuristic(s) that you finally chose to move ahead with along with reason for the same.
4. The resources that you went through to explore various possibilities and for help in writing the code.
5. Does your heuristic(s) generalize to provide a winning strategy for a n-player game? Why or why not?('n' is a variable)

TESTING

To add a twist, the game has been converted to a 3-player game. All the rules remain the same except the fact that there will be 3 players drawing lines and trying to capture the squares. So, your function should be such that it provides a winning strategy for a 3-player game at least.

All the submissions received will be taken 3 at a time and the program will be executed. It will be a best of 3 games contest. The player who wins most games among the 3 games played will receive 5 points in the points table. This will be done for all possible combinations. The top 3 submissions will then be taken for the finals. The finals will be a best of 5 games competition. The submissions whose bot(heuristic) wins most games will be declared the winner.

The winner will be declared based on the tournament that will be played as described in the testing section. However, weightage will be given to the report and the code that has been written while considering club selection and making teams for competitions like Inter-IIT Tech Meet etc:

1. Report - 50%

Note:

- We have gone through all heuristics that have been mentioned in the resources. There is no harm in mentioning and applying them, but exploring and coming up with new strategies will be appreciated and will carry some weightage. However, this does not mean any random heuristic will fetch marks.
- Weightage will not be given to the fluency of English in the report but to the content and the extent to which the report reflects your understanding. However, you are encouraged to write the report using fluent English as much as possible.

SCORING

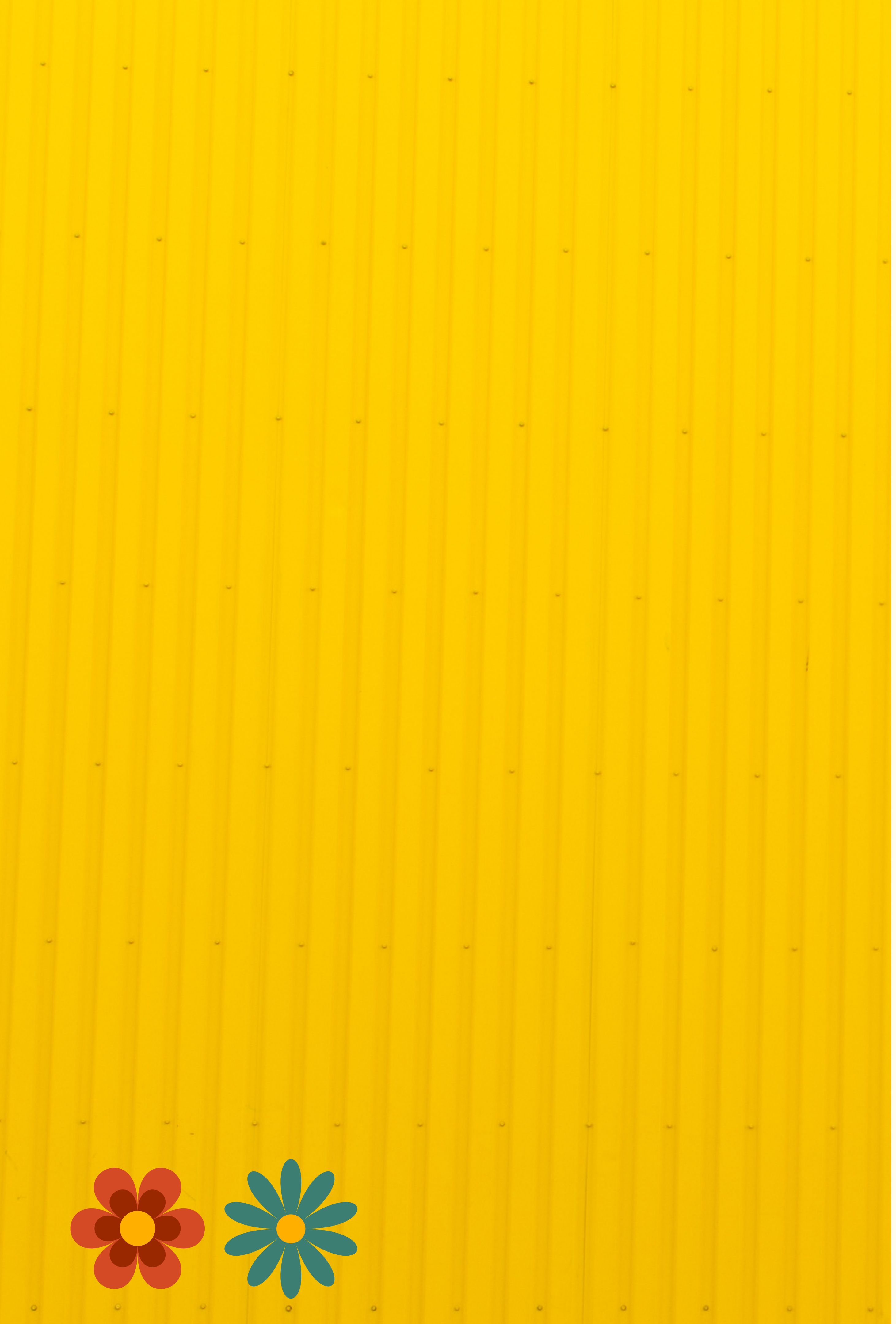
SCORING

2. Code - 30%

Note:

- Weightage will be given to the following:
  - Code Quality
  - Non-erroneous Code

3. Testing - 20%



Resources

Here is a list of resources that might be helpful for you to make your heuristics:

- https://www.gamesforyoungminds.com/blog/2018/12/23/dots-and-boxes
- https://en.wikipedia.org/wiki/Dots_and_boxes
- https://www.youtube.com/watch?v=KboGyIilP6k

These are some resources and you are expected to explore various other possibilities and come up with a winning strategy(there is no harm in employing your own strategy if it gives better results than the ones listed in the resources).

Resources

Here is a link to the complete code of the game “Pacman”. This is not at all related to the Problem statement but has been given to give you an idea of the environment and how things will be at our end: https://github.com/joshkarlin/CS188-Project-1 . In this game, you could have been asked to write the Breadth First Search(BFS) or Depth First Search(DFS) function given in search.py. The rest of the environment remains on our end.

Note: You are expected to put your own efforts in the competition. The competition has been designed to make you learn something. Winning the competition is good but you sincere efforts will be appreciated more. The Problem Statement, along with being a part of SoI, holds importance in your selection to various AI events in the future.

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Thank you!