# COMS2003: Application and Analysis of Algorithms II

Assignment Question 1

2014

## 1 Question 1 - Snake - 50 marks

In this question, you will extend the program produced in the lab sessions. Your program must be able to play the game of snake. The snake game itself will run on the moodle system. It will send you the state of the snake game after every time step. The format of the input will be very similar to the format defined in the lab sessions, with one major difference being that you will receive this input continuously instead of just once. Some information required to set up the game (such as the size of the board) will only be sent once at the start of the game instead of at every step. Your program needs to decide the correct action for the snake at every time step.

The aim of the snake game is to increase your length, which can only be done by eating apples. The game board will contain four snakes and two apples. Every time you eat an apple, your snake grows by five squares. If you crash into anything, your snake dies, and respawns with length 5.

One possible solution is for your snake to always head towards one of the fruits. To implement this strategy, you need to decide in which direction the fruits is. However, the fruits will most often be in a different x coordinate as well as a different y coordinate to the head of your snake. For example, it is possible for the fruits to be both above and to the left of the head of your snake. In this circumstance, you can choose to either go left or upwards.

The downside of this strategy is that if another snake is in your way, you will crash into it. A simple way of overcoming this is to check if your snake will die on the next move if you pick a particular action. If this is the case, avoid taking that action. For instance, you may find yourself in the situation that snake 3 (moving upwards) is in below:

```
0 0 0 0 0 0 0 0 5 0
0 0 0 0 0 5 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0
0 2 2 2 1 0 0 0 0 0
0 0 0 3 1 1 1 0 0 0
0 0 0 3 0 0 0 0 0 0
0 0 0 3 0 0 0 0 0 0
```

In this case, the first part of our process says that our snake should either move right or up, since the fruits are both above and to the right of it. However, the second part of our process should notice that if our snake moves right it will die by crashing into snake 1, and if it moves upwards it will die by crashing into snake 2. In this circumstance, the snake should preserve its life by going left, since this is the only direction which wont result in its death.

Your snake program must be submitted using the moodle system, where it will play against the snake programs built by everyone else in the class.

A snake that plays the game, but plays it very badly will get 10 marks. The strategy described above will be enough to get you 35 marks for this question. A further 10 will be award for ending up in the top 30 in the class. A further 5 will be awarded for ending up in the top 20 in the class.

10 Bonus marks will be awarded to the top 8 snake programs in the class. Note that these programs will have to have some improvements over the strategy described above in order to beat the programs built by the rest of the class.

## 1.1 Input

At the start of the game you will receive a message with the following format:

```
numSnakes width height mode
```

For example, you could get the line

```
4 50 70 1
```

You can assume the number of snakes is always 4 and the game mode is always 1. In this mode, the game is won by the snake that reached the longest total length in the game. Then, the game will send you status messages using standard input at every game step. These messages will be of the form:

```
apple1X apple1Y
apple2X apple2Y
yourSnakeNumber (starts from 0)
snake1
snake2
snake3
snake4
```

Each snake will be of the following form:

```
alive/dead length kills coordinateChain
```

So, an example input set would be:

```
20 15
7 12
39 45
1
alive 26 2 10,12 15,12 15,7 5,7 5,2
alive 6 6 14,13 19,13
alive 2 1 12,13 12,14
alive 10 8 10,2 15,2 15,6 16,6
```

This input would indicate that the board is 20 positions wide and 15 positions tall. One apple is at the 8th column, 13th row and the other is at the 40th column, 46th row. Of the four snakes presented, you are snake number 1 (which is the second snake). Then, for each snake, their coordinates are given. Note that there are no brackets around the coordinates.

## 1.2 Output

Your output must be an integer representing the direction you would like your snake to go. The server will interpret the integers as follows:

```
0 Up
1 Down
2 Left
3 Right
```

So if you output 0 the server will change your direction to Up. Note that if you try to go in the direction you came from (eg. youre currently going left and you output a 3), the server will ignore you as that move cannot be performed.

## 1.3 Hint

Note that you can get up to 60 marks for the assignment by only doing this question!

Start off by using your code developed in the lab sessions. Each time you receive an input message from the server, perform the tasks from the lab, so you end up with a two dimensional representation of the board. Then, determine in which direction the fruit is. Next, determine if going in the direction of the fruit (remember there are at most two directions the fruit is in, one on the x axis and the other on the y axis) will kill you. If not, go in the direction of the fruit, and if so, go in some other direction that wont kill you.

Do not be overwhelmed by the fact that this is a continuous game. All it means is that you are receiving input inside a loop so that you can perform the task from the lab over and over again as new input is received.

If you are having any trouble understanding the formats or what is required of you, please ask me or a tutor. DO NOT PLAGIARISE. I will not only give you zero, but you will have to appear before a disciplinary committee if you are found to have plagiarised.