# CMPE 300 ANALYSIS OF ALGORITHMS

# PROJECT 3 - ANSWERS

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## PART 1

### 1.1) Fill the steps of one successful and one unsuccessful execution for each p value

#### *1.1.1) Success - p=0.7*

|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 46 | -1 | 28 | -1 | -1 | -1 | -1 | 3 |
| **1** | 29 | -1 | 31 | 38 | 27 | 2 | -1 | -1 |
| **2** | -1 | 45 | 26 | -1 | 32 | 37 | 4 | -1 |
| **3** | 25 | 30 | 39 | -1 | 1 | -1 | 33 | 36 |
| **4** | 40 | 15 | 44 | -1 | 22 | 35 | 0 | 5 |
| **5** | 43 | 24 | 41 | 18 | 7 | 10 | -1 | 34 |
| **6** | 14 | 19 | 16 | 23 | 12 | 21 | 6 | 9 |
| **7** | -1 | 42 | 13 | 20 | 17 | 8 | 11 | -1 |

#### *1.1.2) Unsuccessful - p=0.7*

#### 

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **0** | 19 | 4 | 21 | 2 | 17 | -1 | -1 | -1 |
| **1** | -1 | 1 | 18 | -1 | 22 | -1 | 16 | -1 |
| **2** | 5 | 20 | 3 | -1 | 7 | -1 | -1 | -1 |
| **3** | 0 | -1 | 6 | 23 | 10 | -1 | 8 | 15 |
| **4** | -1 | -1 | 11 | -1 | 27 | -1 | -1 | -1 |
| **5** | -1 | -1 | 24 | -1 | 12 | 9 | 14 | -1 |
| **6** | -1 | -1 | -1 | 26 | -1 | 28 | -1 | -1 |
| **7** | -1 | 25 | -1 | -1 | -1 | 13 | -1 | 29 |

#### 

#### 1.1.3) Success - p=0.8

|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 36 | 33 | 0 | 9 | 38 | 11 | 14 | -1 |
| **1** | 47 | 2 | 37 | 34 | 13 | 8 | 39 | 16 |
| **2** | 32 | 35 | 46 | 1 | 10 | 15 | 12 | 25 |
| **3** | 45 | 48 | 3 | 20 | 7 | 26 | 17 | 40 |
| **4** | 4 | 31 | 50 | 29 | -1 | 19 | 24 | 27 |
| **5** | 49 | 44 | -1 | 6 | 21 | 28 | 41 | 18 |
| **6** | -1 | 5 | 30 | 51 | 42 | 23 | -1 | 53 |
| **7** | -1 | -1 | 43 | 22 | -1 | 52 | -1 | -1 |

#### *1.1.4) Unsuccessful - p=0.8*

#### 

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **0** | 24 | 5 | -1 | 13 | 26 | -1 | 36 | -1 |
| **1** | -1 | 10 | 25 | 6 | 35 | -1 | -1 | -1 |
| **2** | 4 | 23 | 12 | 9 | 14 | 27 | 18 | 33 |
| **3** | 11 | -1 | 7 | -1 | 19 | 34 | -1 | 28 |
| **4** | -1 | 3 | 22 | -1 | 8 | 15 | 32 | 17 |
| **5** | -1 | 0 | -1 | 20 | -1 | -1 | 29 | -1 |
| **6** | -1 | 21 | 2 | -1 | -1 | 31 | 16 | -1 |
| **7** | 1 | -1 | -1 | -1 | -1 | -1 | -1 | 30 |

#### 

#### 1.1.5) Success - p=0.85

|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | -1 | -1 | 49 | 16 | 1 | 12 | -1 | -1 |
| **1** | 48 | 15 | 0 | 13 | -1 | 35 | 8 | 11 |
| **2** | -1 | 50 | 17 | 2 | 45 | 10 | 5 | 36 |
| **3** | 18 | 47 | 14 | 29 | 4 | 7 | 34 | 9 |
| **4** | 51 | 30 | 3 | 46 | 23 | 44 | 37 | 6 |
| **5** | 26 | 19 | 22 | 31 | 28 | 33 | 40 | 43 |
| **6** | 21 | 52 | 27 | 24 | 41 | 38 | -1 | -1 |
| **7** | -1 | 25 | 20 | 53 | 32 | -1 | 42 | 39 |

#### *1.1.6) Unsuccessful - p=0.85*

#### 

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **0** | -1 | 1 | -1 | -1 | -1 | -1 | -1 | -1 |
| **1** | -1 | -1 | -1 | 2 | -1 | 18 | -1 | -1 |
| **2** | 0 | 3 | 20 | -1 | -1 | 29 | -1 | -1 |
| **3** | -1 | -1 | -1 | -1 | 19 | -1 | 17 | 8 |
| **4** | 4 | 23 | -1 | 21 | 28 | 7 | 30 | -1 |
| **5** | -1 | 26 | 5 | 24 | 11 | 14 | 9 | 16 |
| **6** | -1 | -1 | 22 | 27 | 6 | -1 | 12 | 31 |
| **7** | -1 | -1 | 25 | -1 | 13 | 10 | 15 | -1 |

#### 

### 1.2) Fill the table and comment on it

#### 1.2.1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **Number of Success** | **Number of Trials** | **Probability** | **Total Time of Execution** |
| **0.7** | 16462 | 100000 | 0.16462 | 4.63 s |
| **0.8** | 3538 | 100000 | 0.03538 | 4.62 s |
| **0.85** | 963 | 100000 | 0.00963 | 4.61 s |

#### 1.2.1) Comments

Also answer these questions while commenting

1- How do changes on p affect total success probability and total execution time?

2- Define trade-offs of the algorithm.

## PART 2

### 2.1) Fill the tables and comment on them

#### 2.1.1) p = 0.7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **k** | **Number of Success** | **Number of Trials** | **Probability** | **Total Time** |
| **0** | 100000 | 100000 | 1.00000 | 3.96 s |
| **2** | 100000 | 100000 | 1.00000 | 4.01 s |
| **3** | 99948 | 100000 | 0.99948 | 4.02 s |

#### 2.1.2) p = 0.8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **k** | **Number of Success** | **Number of Trials** | **Probability** | **Total Time** |
| **0** | 100000 | 100000 | 1.00000 | 4.55 s |
| **2** | 100000 | 100000 | 1.00000 | 4.62 s |
| **3** | 99949 | 100000 | 0.99949 | 4.66 s |

#### 2.1.1) p = 0.85

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **k** | **Number of Success** | **Number of Trials** | **Probability** | **Total Time** |
| **0** | 100000 | 100000 | 1.00000 | 5.57 s |
| **2** | 100000 | 100000 | 1.00000 | 6.05 s |
| **3** | 99936 | 100000 | 0.99936 | 7.07 s |

#### 

2.1.2) Comments

Also answer these questions while commenting

1- How does total time change with k?

2- How do total time change with p for a specific k value? How does this change different from the first part?

3- Run this algorithm for each p value for k a value larger than 10 multiple times. What are your thoughts?

## PART 3

In this part, you will compare Part1 and Part2 algorithms according to their ability to solve the actual Knight’s Problem where p=1.

* Run Part1 algorithm with p=1.
* Run Part2 algorithm with p=1 and k=0.
* Run Part2 algorithm with p=1 and a k value you think will work well.

Clearly state your findings and comment on them. When would you choose Part1 algorithm and when would you choose the other?

1. Run Part1 algorithm with p=1:

LasVegas Algorithm With p = 1.0

Number of successful tours: 0

Number of trials: 100000

Probability of a successful tour: 0.00000

Execution time for p = 1.0: 4.63 seconds

1. Run Part2 algorithm with p=1 and k=0:
2. Run Part2 algorithm with p=1 and a k= :