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

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

#### 

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

#### 

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#### *1.1.3) Success - p=0.8*

#### 

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

#### 

#### 1.1.4) Unsuccessful - p=0.8

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

#### 1.1.5) Success - p=0.85

|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 50 | 47 | 12 | 45 | 26 | 23 | -1 | 21 |
| **1** | -1 | **44** | **49** | **52** | **13** | **20** | **25** | **28** |
| **2** | 48 | **51** | **46** | **11** | **24** | **27** | **22** | **19** |
| **3** | -1 | **10** | **43** | **6** | **53** | **14** | **29** | **32** |
| **4** | -1 | **5** | **38** | **-1** | **42** | **31** | **18** | **15** |
| **5** | 9 | **2** | **7** | **54** | **39** | **16** | **33** | **30** |
| **6** | 0 | **37** | **4** | **41** | **-1** | **35** | **56** | **17** |
| **7** | 3 | **8** | **1** | **36** | **55** | **40** | **-1** | **34** |

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

#### 

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **0** | -1 | -1 | 1 | 20 | -1 | 14 | 17 | 36 |
| **1** | -1 | **-1** | **-1** | **13** | **2** | **19** | **-1** | **15** |
| **2** | -1 | **0** | **3** | **10** | **21** | **16** | **35** | **18** |
| **3** | -1 | **-1** | **12** | **29** | **34** | **9** | **22** | **-1** |
| **4** | -1 | **4** | **33** | **-1** | **11** | **-1** | **25** | **8** |
| **5** | -1 | **-1** | **30** | **5** | **28** | **7** | **-1** | **23** |
| **6** | -1 | **32** | **-1** | **-1** | **-1** | **24** | **-1** | **26** |
| **7** | -1 | **-1** | **-1** | **31** | **6** | **27** | **-1** | **-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(in seconds)** |
| **0.7** | 20077 | 100000 | 0.20077 | 19.57 |
| **0.8** | 3349 | 100000 | 0.03349 | 16.68 |
| **0.85** | 972 | 100000 | 0.00972 | 36.77 |

#### 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 (in seconds)** |
| **0** | 100000 | 100000 | 1.0 | 38.86 |
| **1** | 100000 | 100000 | 1.0 | 40.43 |
| **2** | 100000 | 100000 | 1.0 | 41.52 |
| **3** | 99942 | 100000 | 0.99942 | 39.64 |

#### 2.1.2) p = 0.8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **k** | **Number of Success** | **Number of Trials** | **Probability** | **Total Time** |
| **0** | 100000 | 100000 | 1.0 | 46.89 |
| **1** | 100000 | 100000 | 1.0 | 52.13 |
| **2** | 100000 | 100000 | 1.0 | 48.18 |
| **3** | 99939 | 100000 | 0.99939 | 48.15 |

#### 2.1.1) p = 0.85

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **k** | **Number of Success** | **Number of Trials** | **Probability** | **Total Time** |
| **0** | 100000 | 100000 | 1.0 | 53.89 |
| **1** | 100000 | 100000 | 1.0 | 54.55 |
| **2** | 100000 | 100000 | 1.0 | 66.17 |
| **3** | 99948 | 100000 | 0.99948 | 73.06 |

#### 

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?