



Graph

1- Problemin Çözümü:

Kullanıcıdan ilk başta dosya ismi alınmıştır. Komşuluk matrisini oluşturabilmek için dosyanın ilk satırı okunup parçalara ayrılarak matrisin boyutu hesaplanır. Sonrasında tüm satırlar okunarak hafızada yer açılır.

Kullanıcıdan ödül düğümü alınır. Ödül düğümünü bulmak için matris boyutunda bir sonuç dizisi açılır. İlk durumda tüm değerler 1 yapılır. Sonuç dizisi ödül düğümü olabilecek olan düğümleri saklamak içindir. Dizideki 1 olan elemanların sayısı bir sayaçta tutulur.

İlk olarak sıfırıncı düğümden döngüye başlanılır. Anlık düğüm ödül düğümüne komşu mu? Şeklinde sorulur. Eğer komşu ise kendisi ve kendisine komşu olmayanlar sonuç dizisinde -1 olarak atanır.

Eğer komşu değil ise komşu olduğu düğümler -1 olarak atanır. Döngü, sonuç dizisi sayacı bir değerine düşerse veya anlık düğümün indeksi matrisin boyutunu geçerse sonlanır. Bu sayede algoritma hızlıca sonuçlanır.

Döngü bitişinde sonuç dizisinde bir değerine sahip indeksler yazdırılır. Eğer birden fazla değer bulunduyorsa aynı komşulara sahip düğümler bulunduğu kullanıcıya bildirilir.

En kötü senaryoda $O(N)$ karmaşıklığa sahip olsada ortalamada çok daha hızlı şekilde sonuçlanır.

2- Karşılaşılan Sorunlar:

Girdi dosyasında matrisin boyutu verilmediği için girdi okuma işleminde ilk satır iki kere okunulmak zorunda kalınmıştır.

Problemin daha kısa sürede çözünülmesi için daha iyi bir algoritma aranmış bulunamamıştır. Ortalama $N / 3$, $N / 4$ gibi bir karmaşıklıkta çözüm üretilmektedir.

3- Ekran Çıktıları:

```
Algoritma Ozeti: İlk olarak bir sonuc dizisi acilir ve 1 ile doldurulur.  
Sonuc dizisinin eleman sayisi bir sayac ile tutulur  
0 vertex'inden baslanilarak komsuluk sorgulanir.  
Eger komsu ise vertex'in komsu olmadiklari ve kendisi sonuc dizisinde -1 degerine esitlenir  
Eger komsu degil ise vertex'in komsulari -1'lenir.  
Bu sekilde worst case O(N) olsa da ortalamada hizli bir sekilde sonuc bulunur
```

```
Enter the name of the file you want to load (with .txt)  
Enter Q to Quit: 1.txt
```

```
Matrix size: 6 x 6  
0 1 0 0 0 0  
1 0 1 0 1 0  
0 1 0 1 0 0  
0 0 1 0 0 0  
0 1 0 0 0 1  
0 0 0 0 1 0
```

```
Successfully Loaded File!
```

```
Enter Prize Vertex: 5
```

```
Enter the name of the file you want to load (with .txt)  
Enter Q to Quit: 1.txt
```

```
Matrix size: 6 x 6  
0 1 0 0 0 0  
1 0 1 0 1 0  
0 1 0 1 0 0  
0 0 1 0 0 0  
0 1 0 0 0 1  
0 0 0 0 1 0
```

```
Successfully Loaded File!
```

```
Enter Prize Vertex: 5  
Result Array: [ 1 1 1 1 1 1 ]
```

```
Asking to Vertex 0  
Vertex 0 is not neighbour with 5! Make vertex's neighbours -1  
Result Array: [ 1 -1 1 1 1 1 ]
```

```
Asking to Vertex 1  
Vertex 1 is not neighbour with 5! Make vertex's neighbours -1  
Result Array: [ -1 -1 -1 1 -1 1 ]
```

```
Asking to Vertex 2  
Vertex 2 is not neighbour with 5! Make vertex's neighbours -1  
Result Array: [ -1 -1 -1 -1 -1 1 ]
```

```
Prize Vertex is founded as: 5 in 3 questions
```

3- Ekran Çıktıları:

```
Enter the name of the file you want to load (with .txt)
Enter Q to Quit: 2.txt

Matrix size: 5 x 5
0 0 1 1 1
0 0 1 1 1
1 1 0 1 1
1 1 1 0 1
1 1 1 1 0

Successfully Loaded File!

Enter Prize Vertex: 3
Result Array: [ 1 1 1 1 1 ]

Asking to Vertex 0
Vertex 0 is neighbour with 3! Make vertex and non neighbours -1
Result Array: [ -1 -1 1 1 1 ]

Asking to Vertex 1
Vertex 1 is neighbour with 3! Make vertex and non neighbours -1
Result Array: [ -1 -1 1 1 1 ]

Asking to Vertex 2
Vertex 2 is neighbour with 3! Make vertex and non neighbours -1
Result Array: [ -1 -1 -1 1 1 ]

Asking to Vertex 3
Vertex 3 is not neighbour with 3! Make vertex's neighbours -1
Result Array: [ -1 -1 -1 1 -1 ]

Prize Vertex is founded as: 3 in 4 questions
sinem@Mac-ds4 %
```

```
Enter Q to Quit: 3.txt

Matrix size: 6 x 6
0 1 0 1 0 0
1 0 0 0 1 0
0 0 0 0 0 1
1 0 0 0 1 0
0 1 0 1 0 1
0 0 1 0 1 0

Successfully Loaded File!

Enter Prize Vertex: 4
Result Array: [ 1 1 1 1 1 1 ]

Asking to Vertex 0
Vertex 0 is not neighbour with 4! Make vertex's neighbours -1
Result Array: [ 1 -1 1 -1 1 1 ]

Asking to Vertex 1
Vertex 1 is neighbour with 4! Make vertex and non neighbours -1
Result Array: [ 1 -1 -1 -1 1 -1 ]

Asking to Vertex 2
Vertex 2 is not neighbour with 4! Make vertex's neighbours -1
Result Array: [ 1 -1 -1 -1 1 -1 ]

Asking to Vertex 3
Vertex 3 is neighbour with 4! Make vertex and non neighbours -1
Result Array: [ 1 -1 -1 -1 1 -1 ]

Asking to Vertex 4
Vertex 4 is not neighbour with 4! Make vertex's neighbours -1
Result Array: [ 1 -1 -1 -1 1 -1 ]

Asking to Vertex 5
Vertex 5 is neighbour with 4! Make vertex and non neighbours -1
Result Array: [ -1 -1 -1 -1 1 -1 ]

Prize Vertex is founded as: 4 in 6 questions
```

Ekstrem Durumlar:

30 düğümlük 30x30 matris ile algoritma performansı test edilmiştir

```
Matrix size: 30 x 30
0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1
0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1 1 1 0 0 0 0 0 0 0 0 0
0 0 0 0 1 1 0 1 0 0 1 0 0 0 1 1 0 1 0 1 1 1 0 0 0 0 1 1 1 1 1
0 0 0 0 1 1 1 0 1 1 1 1 0 1 1 0 1 1 1 0 0 0 1 1 1 0 0 0 0 0 1
1 1 1 1 0 0 1 0 0 1 0 0 0 0 1 1 1 0 0 0 0 0 0 1 1 1 1 0 0 0
0 1 1 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 1 0 0 1 0 0 0 0 0 0
1 0 0 1 1 0 0 1 0 0 1 0 0 1 0 0 0 1 0 1 0 1 1 0 0 1 0 1 0 0 1
1 0 1 0 0 0 1 0 1 0 0 0 0 1 1 1 1 0 0 1 0 0 0 1 1 0 1 1 1 1 0
0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 1 0 0 1 1 0
0 1 0 1 1 0 0 0 0 0 0 0 1 0 0 1 1 1 0 1 0 1 0 0 0 0 0 1 0 0 0
0 0 1 1 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0
0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0
0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 0 1 0 1 0 1 1 0
1 0 1 1 1 0 0 1 0 1 0 0 0 0 0 0 0 1 0 1 0 0 1 0 1 1 0 0 0 1 0
0 0 1 0 1 1 0 1 0 1 1 1 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 1
0 0 0 1 1 0 1 0 1 0 1 1 0 1 0 1 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0
0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0
0 1 0 1 0 0 1 1 0 1 0 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 1 0 1 0
0 1 1 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 0
0 1 1 0 0 1 1 0 1 1 0 0 0 1 0 1 0 0 1 0 0 0 0 0 1 0 1 0 0 0
0 1 1 0 0 0 1 0 0 0 0 1 1 0 1 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0
0 1 0 1 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 1 0
0 0 0 1 0 1 0 1 0 0 0 0 0 1 1 1 1 0 0 0 0 0 1 0 1 1 0 0 0
0 0 0 1 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0 0 1 1 0 1 1 0 0 1 0
1 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 1 1 0
0 0 1 0 1 0 1 0 1 1 0 0 1 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 1
0 0 1 0 1 0 0 1 1 0 0 0 1 0 0 0 1 1 0 1 0 0 1 0 0 1 0 0 1
0 0 1 0 0 0 0 1 1 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0
1 0 1 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 1 1 1 0 0
```

Successfully Loaded File!

Enter Prize Vertex: █


```
1 0 1 1 1 0 0 1 0 1 0 0 0 0 0 0 1 0 1 0 0 1 0 1 1 0 0 0 1 0
0 0 1 0 1 1 0 1 0 1 1 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 1
0 0 0 1 1 0 1 0 1 1 0 1 0 1 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0
0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0
0 1 0 1 0 0 1 1 0 1 0 0 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 1 0 1 0
0 1 1 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 0
0 1 1 0 0 1 1 0 1 1 0 0 0 1 0 1 0 0 1 0 0 0 0 0 1 0 1 0 0 0
0 1 1 0 0 0 1 0 0 0 0 1 1 0 1 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0
0 1 0 1 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 1 0 0
0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 1 1 1 1 0 0 0 0 0 1 0 1 1 0 0 0
0 0 0 1 1 0 1 0 1 0 0 0 0 0 1 0 0 0 0 0 1 1 0 1 1 0 0 1 0 0 1
1 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 1 1 0 1
0 0 1 0 1 0 1 1 0 1 1 0 1 0 0 1 0 0 0 0 0 1 0 1 1 0 0 1 1 0 0 1
0 0 1 0 1 0 0 1 1 0 0 0 0 1 0 0 1 1 0 1 0 0 1 0 0 1 0 0 1 1
0 0 1 0 0 0 0 1 1 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0
1 0 1 1 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1 0 0
```

Successfully Loaded File!

Enter Prize Vertex: 25

Result Array: [1]

Asking to Vertex 0

Vertex 0 is neighbour with 25! Make vertex and non neighbours -1

Result Array: [-1 -1 -1 -1 -1 1 -1 1 1 -1 -1 -1 -1 -1 1 -1 -1 -1 -1 -1 -1 -1 -1 1 -1 -1 -1]

Asking to Vertex 1

Vertex 1 is not neighbour with 25! Make vertex's neighbours -1

Result Array: [-1 -1 -1 -1 -1 -1 1 1 -1 -1 -1 -1 -1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 -1 -1 1]

Asking to Vertex 2

Vertex 2 is not neighbour with 25! Make vertex's neighbours -1

Result Array: [-1 -1 -1 -1 -1 -1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 -1 -1 -1]

Asking to Vertex 3

Vertex 3 is not neighbour with 25! Make vertex's neighbours -1

Result Array: [-1 1 -1 -1 -1]

Prize Vertex is founded as: 25 in 4 questions

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```
0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0
0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 0 1 0 1 0 1 1 0
1 0 1 1 1 0 0 1 0 1 0 0 0 0 0 0 0 1 0 1 0 0 1 0 1 1 0 0 0 1 0
0 0 1 0 1 1 0 1 0 1 1 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 1
0 0 0 1 1 0 1 0 1 1 0 1 0 1 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0
0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0
0 1 0 1 0 0 1 1 0 1 0 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 1 0 1 0
0 1 1 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 0
0 1 1 0 0 1 1 0 1 1 0 0 0 1 0 1 0 0 1 0 0 0 0 0 1 0 1 0 0 0
0 1 1 0 0 0 1 0 0 0 0 1 1 0 1 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0
0 1 0 1 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 1 0 0
0 0 0 1 0 1 0 1 0 0 0 0 0 1 1 1 1 0 0 0 0 0 1 0 1 1 0 0 0 0
0 0 0 1 1 0 1 0 1 0 0 0 0 0 1 0 0 0 0 1 1 0 1 1 0 0 1 0 0 1
1 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 1 1 0 1
0 0 1 0 1 0 1 1 0 1 0 0 1 0 0 0 0 0 1 0 1 1 0 0 1 1 0 0 0 1
0 0 1 0 1 0 0 1 1 0 0 0 0 1 0 0 1 1 0 1 0 0 1 0 0 1 0 0 1 1
0 0 1 0 0 0 0 1 1 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0
1 0 1 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1 0 0
```

Successfully Loaded File!

Enter Prize Vertex: 4

Result Array: [1]

Asking to Vertex 0

Vertex 0 is neighbour with 4! Make vertex and non neighbours -1

Result Array: [-1 -1 -1 -1 1 -1 1 1 -1 -1 -1 -1 -1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 -1 -1 1]

Asking to Vertex 1

Vertex 1 is neighbour with 4! Make vertex and non neighbours -1

Result Array: [-1 -1 -1 -1 1 -1]

Prize Vertex is founded as: 4 in 2 questions

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