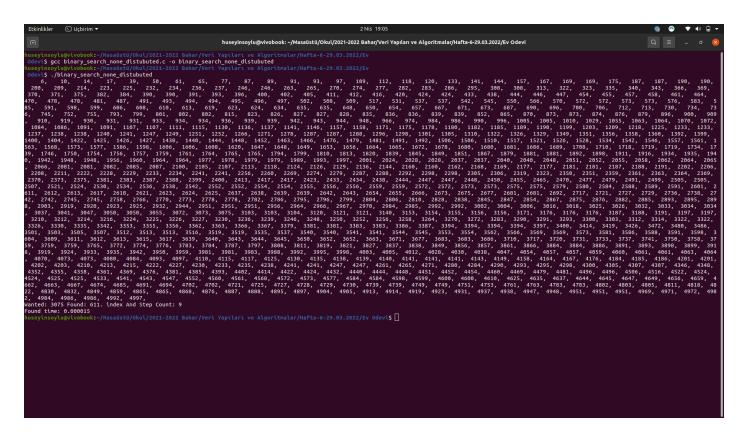
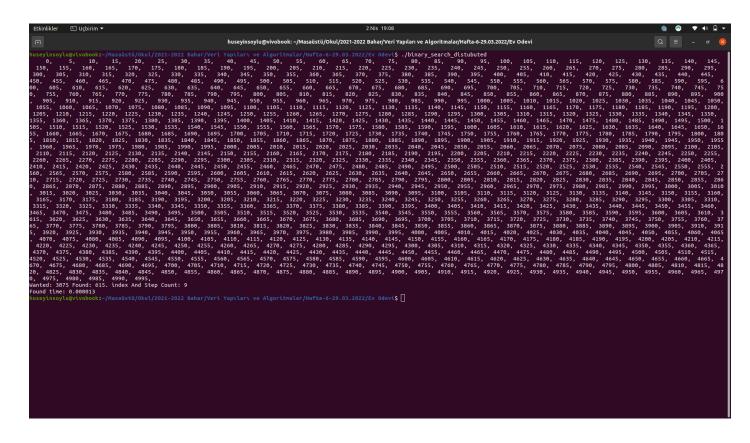
Veri Yapıları ve Algoritmalar-Ödev6

1-) Binary Search Algrithm

• <u>Eşit Dağılımlı</u>



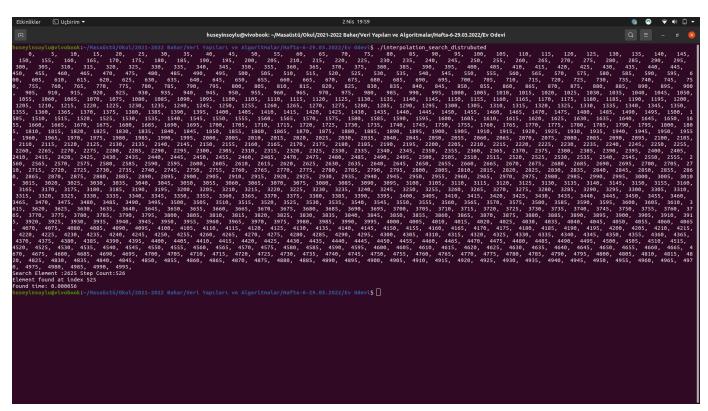
• Eşit Dağılımsız



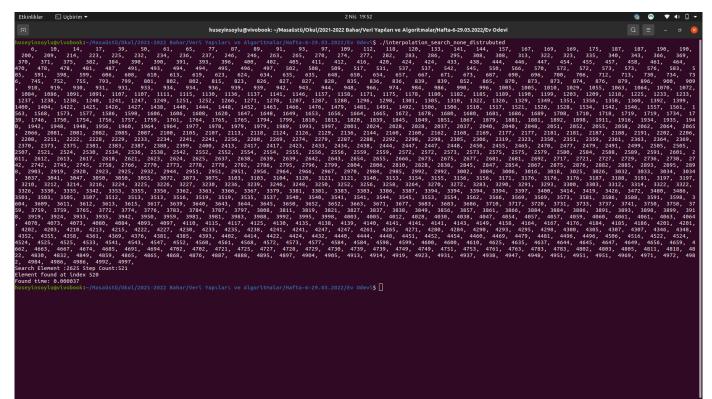
- Aramada 1000 Elemanlı bir sıralı dizi kullanılmıştır. 612 numaralı eleman toplam 9 iterasyonda bulunmuştur. Bulunma süresi 0.000013 – 0.000017 arasında değişmektedir.
- Algoritmanın zaman analizi O(Log(n))'dir.
- Algoritma dizinin eşit dağılımlı olup olmamasına bağlı değildir.

2-) İnterpolasyon Search Algorithm

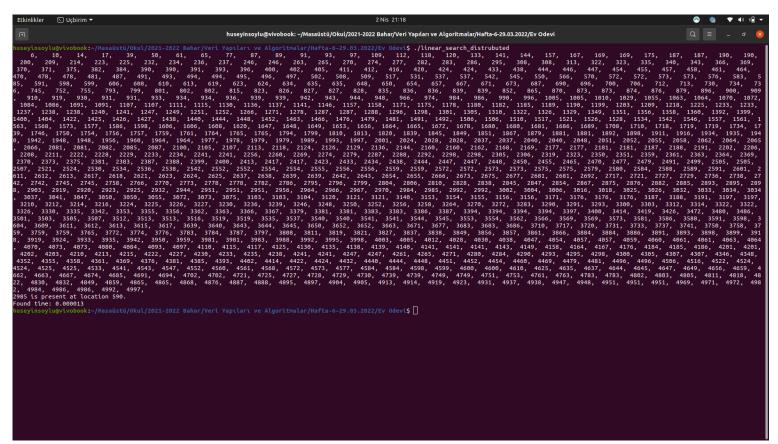
• Eşit Dağılımlı



• Eşit Dağılımsız



- Aramada 1000 Elemanlı bir sıralı dizi kullanılmıştır.
- Sabit dağılımlı dizi ile sabit aralıksız dizi arasında çok büyük bir fark gözlemlenmemiştir.
- Sabit dağılımlı dizi 0.000056 saniyede çözüme ulaşmıştır.
- Sabit dağılımsız dizi 0.000060 saniyede çözüme ulaşmıştır.(Birkaç kez çalıştırıldı)
- Çok fazla kez çalıştırırsak aralarında fark olmadığını gözlemleriz
- Algoritmanın çalışma zamanı O(Log(n))' dir.
- 3-) Sequential Search Algorithm



- Aramada 1000 Elemanlı bir sıralı dizi kullanılmıştır.
- Bu arama türünde herhangi bir şekilde dağılımlı ya da dağılımsız diye ayrım yapmak doğru olmayacaktır. Çünkü aranan değer her nerde ise oraya kadar bir döngü yardımı ile gitmek zorundayız.
- Algoritmanın çalışma zamanı O(N)'dir. Çünkü alternatif bir yol yoktur arama yaparken. Tek tek gezilmek zorundadır.
- Bulunan index: 590.
- Bulunma Zamanı: 0.000013 saniye.

Buraya kadar yapmış olduğum tüm algoritmalar durumu bilinmeyen algoritmalar olarak literatürde geçmektedir. Bundan sonraki vereceğim iki örnek ise durumu bilinen algoritmalar olarak literatürde geçmektedir.

4-) Prims - Kruskal Search Algorithm

```
huseyinsoylu@vivobook:~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev Odevi$ ./prims_kruskal Edge : Weight
0 - 1 : 9
1 - 3 : 19
3 - 4 : 31
3 - 2 : 51
Matrix Size: 5X5
Step Count:4
Found time: 0.000313
huseyinsoylu@vivobook:~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev Odevi$
```

- Algoritma için 5X5 matris kullanılmıştır.
- Adım Sayısı: 4
- Çalışma Zamanı: 0.000313 Saniye.

Karşılaştırma Tablosu

| <u>Algoritma</u> | <u>Çalışma Zamanı</u> | <u>Karmaşıklık</u> | <u>Adım Sayısı</u> |
|----------------------|-----------------------|---------------------|--------------------|
| Binary Search | 0.000013 - 0.000017 | O(Log(n)) | 612. İndex–9 Adım |
| İnterpolation Search | 0.000056 - 0.000060 | O(Log(n)) | 520.İndex–521 Adım |
| Prims - Kruskal | 0.000313 | Değişmekte - O(n^2) | 4. Adımda buldu. |
| Sequration Search | 0.000013 | O(n) | n. indis için n |
| | | | |

^{*1000} Elemanlı dizi ve 5X5 matris kullanılmıştır.

KAYNAK KODLAR

1-)Binary Search

#include <stdio.h>

```
#include <time.h>
#include <stdlib.h>
#include <time.h>

void print_array(int array[],int num){
    for(int i=0;i<num;i++){</pre>
```

```
printf("%6d,",array[i]);
     printf("\n");
}
int main()
{
                                              25,
     int array[1000] = \{0,
                          5,
                              10,
                                   15,
                                         20,
                                                   30,
                                                         35,
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                                                                         50,
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                                                     180,
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                                   165,
                                                           185,
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                             230,
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555,
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                                               665,
                                                     670,
                                                           675,
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                                                                680,
                                                                      685,
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                                               735,
                                                     740,
                                                           745,
                                                                750,
                                                                      755,
695,
     700,
           705,
                 710,
                       715,
                                                                            760,
                                               805,
                                                          815,
                                                                      825,
765,
     770,
           775,
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                       785,
                             790,
                                   795,
                                         800,
                                                    810,
                                                                820,
                                                                            830,
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                                   865,
                                               875,
                                                    880,
                                                          885,
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                 850,
                             860,
                                         870,
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975.
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```

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3575, 3580, 3585, 3590, 3595, 3600, 3605, 3610, 3615, 3620, 3625, 3630, 3635,
3640, 3645, 3650, 3655, 3660, 3665, 3670, 3675, 3680, 3685, 3690, 3695, 3700,
3705, 3710, 3715, 3720, 3725, 3730, 3735, 3740, 3745, 3750, 3755, 3760, 3765,
3770, 3775, 3780, 3785, 3790, 3795, 3800, 3805, 3810, 3815, 3820, 3825, 3830,
3835, 3840, 3845, 3850, 3855, 3860, 3865, 3870, 3875, 3880, 3885, 3890, 3895,
3900, 3905, 3910, 3915, 3920, 3925, 3930, 3935, 3940, 3945, 3950, 3955, 3960,
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4160, 4165, 4170, 4175, 4180, 4185, 4190, 4195, 4200, 4205, 4210, 4215, 4220,
4225, 4230, 4235, 4240, 4245, 4250, 4255, 4260, 4265, 4270, 4275, 4280, 4285,
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4355, 4360, 4365, 4370, 4375, 4380, 4385, 4390, 4395, 4400, 4405, 4410, 4415,
4420, 4425, 4430, 4435, 4440, 4445, 4450, 4455, 4460, 4465, 4470, 4475, 4480,
4485, 4490, 4495, 4500, 4505, 4510, 4515, 4520, 4525, 4530, 4535, 4540, 4545,
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4680, 4685, 4690, 4695, 4700, 4705, 4710, 4715, 4720, 4725, 4730, 4735, 4740,
4745, 4750, 4755, 4760, 4765, 4770, 4775, 4780, 4785, 4790, 4795, 4800, 4805,
4810, 4815, 4820, 4825, 4830, 4835, 4840, 4845, 4850, 4855, 4860, 4865, 4870,
4875, 4880, 4885, 4890, 4895, 4900, 4905, 4910, 4915, 4920, 4925, 4930, 4935,
4940, 4945, 4950, 4955, 4960, 4965, 4970, 4975, 4980, 4985, 4990, 4995};
    //print_randoms_array(array,0,5000,1000);
    //bubble short array(array,1000);
```

```
print_array(array,1000);
     int low
                = 0;
     int high
                  = 1000;
     int flag
                = 0;
               = 3075;
     int s
     int search_step=0;
     start_t = clock();
     while(low <= high){
     search_step++;
           int index = low+(high-low)/2;
           if(array[index] == s){
                 flag = 1;
                printf("Wanted: %d Found: %d. index And Step Count: %d \
n",s,index,search_step);
                break;
           else if(array[index] < s){</pre>
                low = index+1;
           else{
                 high = index-1;
           }
     if(flag == 0){
           printf("Not Found!\n");
     end_t = clock();
     printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
     return 0;
}
```

1-)İnterpolation Search

```
#include <stdio.h>
#include <time.h>
#include <stdlib.h>
#include <time.h>

void print_array(int array[],int num){
    for(int i=0;i<num;i++){</pre>
```

```
printf("%6d,",array[i]);
     }
     printf("\n");
}
/*int interpolationSearch(int arr[], int lo, int hi, int x)
  int pos;
  // Since array is sorted, an element present
  // in array must be in range defined by corner
  if (lo \le hi \&\& x \ge arr[lo] \&\& x \le arr[hi]) {
     // Probing the position with keeping
     // uniform distribution in mind.
     pos = lo
         + (((double)(hi - lo) / (arr[hi] - arr[lo]))
           * (x - arr[lo]));
     // Condition of target found
     if (arr[pos] == x)
       return pos;
     // If x is larger, x is in right sub array
     if (arr[pos] < x)
       return interpolationSearch(arr, pos + 1, hi, x);
     // If x is smaller, x is in left sub array
     if (arr[pos] > x)
       return interpolationSearch(arr, lo, pos - 1, x);
  return -1;
}*/
int interpol_search(int arr[], int lb, int ub, int x)
{
  int step_count=0;
  while ((arr[lb] != arr[ub]) && (x \le arr[ub]) && (x \ge arr[lb])) 
     step count++;
     int pos = lb + (((ub - lb) / (arr[ub] - arr[lb])) * (x - arr[lb]));
     if (arr[pos] == x){
     printf("Search Element :%d Step Count:%d\n",x,step_count);
     return pos;
     }
```

```
if (arr[pos] < x)
      lb = pos + 1;
    else
       ub = pos - 1;
  return -1;
}
int main()
{
                       10,
                             15,
                                  20,
                                       25,
                                            30,
                                                  35,
     int arr[]=\{0,
                   5,
                                                       40,
                                                            45,
                                                                  50,
                                                                       55,
                                                                            60,
                    85,
                          90,
                               95, 100, 105, 110,
                                                                 125,
                                                                       130,
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          75,
               80,
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1890, 1895, 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940, 1945, 1950,
1955, 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015,
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3125, 3130, 3135, 3140, 3145, 3150, 3155, 3160, 3165, 3170, 3175, 3180, 3185,
3190, 3195, 3200, 3205, 3210, 3215, 3220, 3225, 3230, 3235, 3240, 3245, 3250,
3255, 3260, 3265, 3270, 3275, 3280, 3285, 3290, 3295, 3300, 3305, 3310, 3315,
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3385, 3390, 3395, 3400, 3405, 3410, 3415, 3420, 3425, 3430, 3435, 3440, 3445,
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3580, 3585, 3590, 3595, 3600, 3605, 3610, 3615, 3620, 3625, 3630, 3635, 3640,
3645, 3650, 3655, 3660, 3665, 3670, 3675, 3680, 3685, 3690, 3695, 3700, 3705,
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4230, 4235, 4240, 4245, 4250, 4255, 4260, 4265, 4270, 4275, 4280, 4285, 4290,
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4360, 4365, 4370, 4375, 4380, 4385, 4390, 4395, 4400, 4405, 4410, 4415, 4420,
4425, 4430, 4435, 4440, 4445, 4450, 4455, 4460, 4465, 4470, 4475, 4480, 4485,
4490, 4495, 4500, 4505, 4510, 4515, 4520, 4525, 4530, 4535, 4540, 4545, 4550,
4555, 4560, 4565, 4570, 4575, 4580, 4585, 4590, 4595, 4600, 4605, 4610, 4615,
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4685, 4690, 4695, 4700, 4705, 4710, 4715, 4720, 4725, 4730, 4735, 4740, 4745,
4750, 4755, 4760, 4765, 4770, 4775, 4780, 4785, 4790, 4795, 4800, 4805, 4810,
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4880, 4885, 4890, 4895, 4900, 4905, 4910, 4915, 4920, 4925, 4930, 4935, 4940,
4945, 4950, 4955, 4960, 4965, 4970, 4975, 4980, 4985, 4990, 4995};
```

```
clock_t start_t, end_t;
     print_array(arr,1000);
     int n = sizeof(arr) / sizeof(arr[0]);
     start_t = clock();
     int search_element = 2625;
     int index = interpol_search(arr, 0, n - 1, search_element);
     end_t = clock();
     if (index != -1)
     printf("Element found at index %d\n", index);
     else
     printf("Element not found.\n");
     printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
     return 0;
}
3-)Sequration Search
#include <stdio.h>
#include <time.h>
#include <stdlib.h>
```

void print_array(int array[],int num){

printf("%6d,",array[i]);

 $for(int i=0;i < num;i++){$

printf("\n");

}

```
int linear_search(int *pointer, int n, int find)
{
 int c;
 for (c = 0; c < n; c++)
   if ( *(pointer+c) == find )
     return c;
 }
 return -1;
}
int main()
{
                                      39,
     int array={6},
                      10,
                           14,
                                 17,
                                            50,
                                                 61,
                                                       65,
                                                            77,
                                                                  87,
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                             133,
                                        144,
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           112,
                 118,
                       120,
                                               157,
                                                     167,
                                                                 169,
97,
    109,
                                  141,
                                                                        175,
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                        209,
                              214,
                                                232,
                                                                   237,
                                                                         246,
187,
            190,
                  200,
                                    223,
                                          225,
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                                                             236,
                                                                               246,
      190,
      265,
                  274,
                        277,
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                                    283,
                                          286,
                                                295,
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                                                                   313,
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263,
            270,
                        369,
                                                382,
335,
            343,
                  366,
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                        623,
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            613,
                  619,
                              624,
                                    634,
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                                                             650,
                                                                   654,
                                                                         657,
                                                                               667,
      610,
      673,
671,
                  690,
                        696,
                              700,
                                    706,
                                          712,
                                                713,
                                                       730,
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                                                                   736,
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                                                                               752,
            687,
                                          823,
                                                826,
                                                            827,
755,
      793,
            799,
                  801,
                        802,
                              802,
                                    815,
                                                       827,
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                              870,
                                    873,
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4739, 4739, 4749, 4749, 4751, 4753, 4761, 4763, 4783, 4783, 4802, 4803, 4805,
4811, 4818, 4822, 4830, 4832, 4849, 4859, 4865, 4865, 4868, 4876, 4887, 4888,
4895, 4897, 4904, 4905, 4913, 4914, 4919, 4923, 4931, 4937, 4938, 4947, 4948,
4951, 4951, 4951, 4969, 4971, 4972, 4982, 4984, 4986, 4986, 4992, 4997};
     print_array(array,1000);
     clock_t start_t, end_t;
    int search, c, position;
     start t = clock();
     position = linear_search(array, 1000, 2985);
     end_t = clock();
     if (position == -1)
     printf("%d is not present in array.\n", 2985);
     else
     printf("%d is present at location %d.\n", 2985, position+1);
     printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
    return 0;
}
```

4-)Prim-Kruskal Search

```
#include<stdio.h>
#include<stdbool.h>
#include <time.h>
#include <string.h>
```

```
#define INF 9999999
// number of vertices in graph
#define V 5
// create a 2d array of size 5x5
//for adjacency matrix to represent graph
int G[V][V] = {
 \{0, 9, 75, 0, 0\},\
 \{9, 0, 95, 19, 42\},\
 \{75, 95, 0, 51, 66\},\
 \{0, 19, 51, 0, 31\},\
 {0, 42, 66, 31, 0};
int main() {
 clock_t start_t, end_t;
 start_t = clock();
 int no_edge; // number of edge
 // create a array to track selected vertex
 // selected will become true otherwise false
 int selected[V];
 // set selected false initially
 memset(selected, false, sizeof(selected));
 // set number of edge to 0
 no_edge = 0;
 // the number of egde in minimum spanning tree will be
 // always less than (V -1), where V is number of vertices in
 //graph
 // choose 0th vertex and make it true
 selected[0] = true;
 int x; // row number
 int y; // col number
 // print for edge and weight
 printf("Edge : Weight\n");
 int step_count =0;
```

```
while (no_edge < V - 1) {
 step_count++;
 //For every vertex in the set S, find the all adjacent vertices
 // , calculate the distance from the vertex selected at step 1.
 // if the vertex is already in the set S, discard it otherwise
 //choose another vertex nearest to selected vertex at step 1.
 int min = INF;
 x = 0;
 y = 0;
 for (int i = 0; i < V; i++) {
  if (selected[i]) {
    for (int j = 0; j < V; j++) {
     if (!selected[j] && G[i][j]) { // not in selected and there is an edge
      if (\min > G[i][j]) {
       min = G[i][j];
       x = i;
       y = j;
 printf("%d - %d : %d\n", x, y, G[x][y]);
 selected[y] = true;
 no_edge++;
end_t = clock();
printf("Matrix Size: 5X5\n");
printf("Step Count:%d\n",step_count);
printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
return 0;
```