LAPORAN TUGAS KECIL 2

IF2211 STRATEGI ALGORITMA

Mencari Pasangan Terdekat 3D dengan Algoritma *Divide and Conquer*

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PROGRAM STUDI TEKNIK INFORMATIKA
SEKOLAH TEKNIK ELEKTRO DAN INFORMATIKA
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BANDUNG

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A. ALGORITMA

1. Divide and conquer

Strategi algoritma divide and conquer digunakan pada fungsi terdekat untuk menyelesaikan permasalahan mencari pasangan titik terdekat. Pada fungsi ini, langkah-langkah yang dilakukan adalah:

- Pada fungsi brute_forcce digunakan untuk menyelesaikan solusi angka n dibawah tiga
- Jika jumlah titik lebih dari 3, maka dilakukan rekursi dengan membagi himpunan titik menjadi dua bagian, dan mencari pasangan titik terdekat di setiap bagian tersebut.
- Kemudian, dicari pasangan titik terdekat yang melintasi kedua bagian terebut dengan menggunakan fungsi terdekat

2. Brute Force

Algorirma brute force ini digunakan untuk menyelesaikan masalh mencari pasangan titik terdekat dengan jumlah kurang dari tiga, Langkah-langkah-nya sebagai berikut :

- Mencari titik terdekat dari bagian ,asing-masing.

- Hitung jarak dengan fungsi jarak().

- Membandingkan jarak antara titik yang pasangannya paling dekat.

B.KODE PROGRAM

```
import math

import time

import random

start_time = time.time()

# fungsi untuk menghitung jarak antara dua titik dalam ruang 3D

def cari_jarak(p1, p2):

    return math.sqrt((p1[0]-p2[0])**2 + (p1[1]-p2[1])**2 + (p1[2]-p2[2])**2)


# fungsi untuk mencari jarak terdekat dari pasangan titik dalam daftar P

def closest_pair_3d(P):

    n = len(P)

    if n <= 3:
```

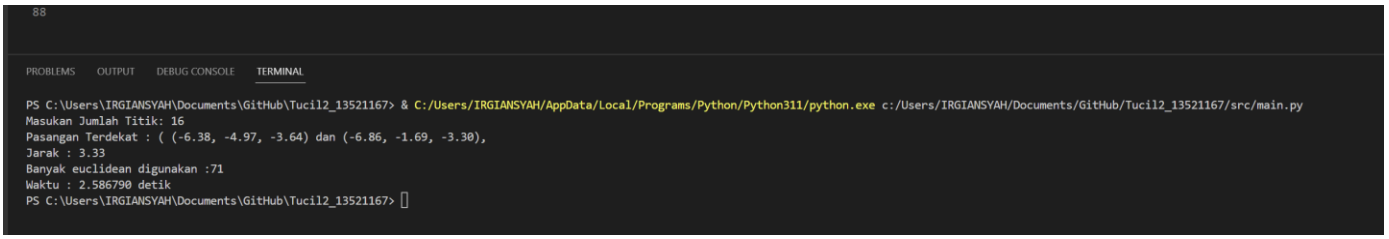
```
    min_pair = min([(P[i], P[j]) for i in range(n) for j in range(i+1, n)], key=lambda pair: cari_jarak(pair[0], pair[1]))
    return (cari_jarak(min_pair[0], min_pair[1]), min_pair)

  # membagi daftar P menjadi dua bagian
  mid = n // 2
  Pl = P[:mid]
  Pr = P[mid:]

  # mencari jarak terdekat dari pasangan titik di setiap bagian
  dl, min_pair_l = closest_pair_3d(Pl)
  dr, min_pair_r = closest_pair_3d(Pr)
  d, min_pair = (dl, min_pair_l) if dl < dr else (dr, min_pair_r)

  # mencari jarak terdekat dari pasangan titik yang satu berada di Pl dan yang satu lagi berada di Pr
  mid_point = P[mid][0]
  S = [p for p in P if mid_point - d <= p[0] <= mid_point + d]
  S.sort(key=lambda x: x[1])
  k = len(S)
  for i in range(k):
    for j in range(i+1, min(i+8, k)):
      d_ij = cari_jarak(S[i], S[j])
      if d_ij < d:
        d = d_ij
        min_pair = (S[i], S[j])

  return (d, min_pair)

# fungsi untuk menghasilkan titik-titik secara acak dalam ruang 3D
```

```
def acak(n):
    points = []
    for i in range(n):
        x = random.uniform(0, 100)
        y = random.uniform(0, 100)
        z = random.uniform(0, 100)
        points.append((x, y, z))
    return points

# fungsi utama
def main():
    end_time = time.time()
    elapsed_time = end_time - start_time
    # input jumlah titik dari pengguna
    n = int(input("Masukkan jumlah titik: "))

    # menghasilkan titik-titik secara acak
    P = acak(n)

    # # mencetak daftar titik-titik
    # print("Daftar titik-titik: ", P)

    # mencetak jarak terdekat antara pasangan titik
    closest_pair_distance, closest_pair = closest_pair_3d(P)
    print("Jarak terdekat antara pasangan titik: ", closest_pair_distance)

    # Print Pasangan terdekat
    print("Pasangan titik terdekat: ", closest_pair)
```

```
    # mencetak waktu yang keluar
    print("Waktu : {:.6f} detik".format(elapsed_time))


if __name__ == '__main__':
    main()
```

3. TES KASUS

a. n = 16



b. n = 64

```
PS C:\Users\IRGIANSYAH\Documents\GitHub\Tucil2_13521167> & C:/Users/IRGIANSYAH/AppData/Local/Programs/Python/Python311/python.exe c:/Users/IRGIANSYAH/Documents/GitHub/Tucil2_13521167/src/
main.py
Masukkan jumlah titik: 64
Daftar titik-titik:  [(28.958664450528627, 75.10680823900047, 8.491457072646448), (57.72420780274297, 45.07841375055056, 42.642335092288086), (4.692367080133786, 81.31476713187308, 90.992
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Waktu : 0.000000 detik
```

c. n = 128

```
PS C:\Users\IRGIANSYAH\Documents\GitHub\Tucil2_13521167> & C:/Users/IRGIANSYAH/AppData/Local/Programs/Python/Python311/python.exe c:/Users/IRGIANSYAH/Documents/GitHub/Tucil2_13521167/src/
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Jarak terdekat antara pasangan titik:  3.683595343856094
Pasangan titik terdekat:  ((6.895773081480538, 39.280083947114285, 45.142197038793256), (7.205918620780771, 42.238542341396645, 42.969592995017514))
Waktu : 0.000000 detik
```

d. n = 1000

Dengan tidak mencantumkan daftar titik-titik dikarenakan akan terlalu banyak.

3. GITHUB dan TABEL AKHIR

Link Repo : https://github.com/irgimondo/Tucil2_13521167.git

Poin	Ya	Tidak
1. Program berhasil dikompilasi tanpa ada kesalahan.	✓	
2. Program berhasil *running*	✓	
3. Program dapat menerima masukan dan dan menuliskan luaran.	✓	
4. Luaran program sudah benar (solusi *closest pair* benar)	✓	
5. Bonus 1 dikerjakan		✓
6. Bonus 2 dikerjakan		✓