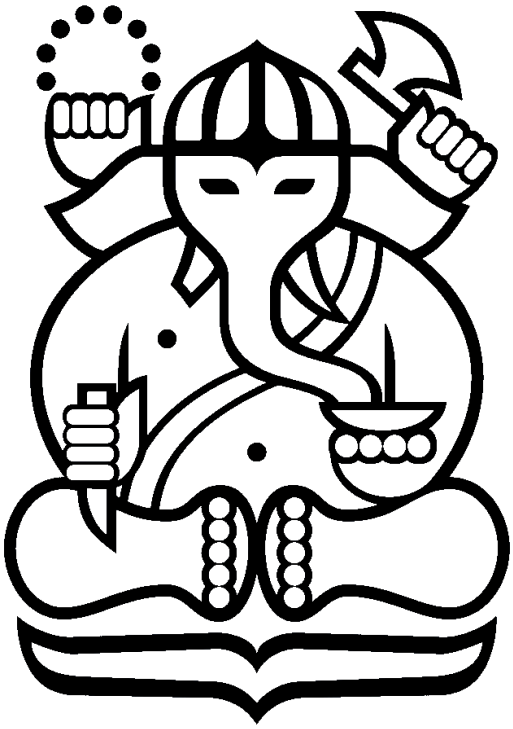
TUGAS KECIL 1 IF2211 STRATEGI ALGORITMA
PENYELESAIAN CYBERPUNK 2077 BREACH PROTOCOL DENGAN ALGORITMA BRUTE FORCE



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BAB I
ALGORITMA BRUTE FORCE

Algoritma *brute force* adalah pendekatan yang lempang (*straightforward*) untuk memecahkan suatu persoalan. Biasanya algoritma *brute force* didasarkan pada pernyataan pada persoalan (*problem statement*) dan definisi/konsep yang dilibatkan. Algoritma *brute force* memecahkan persoalan dengan sangat sederhana, langsung, dan jelas caranya (*obvious way*).

Langkah penggunaan algoritma *brute force* pada program yang telah saya buat adalah dengan:

1. Pada awal, token diawali dengan token pada ujung kiri atas.
2. Kemudian dilakukan iterasi secara rekursif, apabila langkah terkini adalah langkah yang ganjil (current_buffer % 2 = 1), maka iterasi dilakukan secara vertikal. Apabila genap, maka iterasi dilakukan secara horizontal. Pembagian kasus ini (ganjil dan genap) dilakukan agar urutan gerakan terjadi secara vertikal-horizontal-vertikal-horizontal-...
3. Pencarian setiap token pada path dilakukan dari atas ke bawah (vertikal) dan dari kiri ke kanan (horizontal).
4. Iterasi rekursif terus diulang hingga path terkini telah mencapai limit buffer atau sudah memiliki seluruh sekuens (memperoleh sekuens optimal). Ketika sudah mencapai limit atau sudah memiliki seluruh sekuens, program akan menambahkan path ini kedalam suatu array.
5. Selanjutnya, iterasi akan dilakukan terus-menerus terhadap semua path yang bermula setiap dari semua token pada baris paling atas.
6. Setiap *path* kemudian akan dioptimasi dengan menghapus token akhir yang apabila dihapus, tidak akan mengubah nilai reward.

Langkah tersebut termasuk penggunaan algoritma *brute force* karena mencari seluruh kemungkinan *path* sehingga diperoleh path yang memperoleh nilai hadiah tertinggi dengan token paling sedikit (optimal). Semua inputan dari program ini dianggap benar dan sesuai.

BAB II
IMPLEMENTASI ALGORITMA DALAM BAHASA PYTHON

2.1 Fungsi main.py

Fungsi	Deskripsi
`def read_file(file_name)`	Fungsi ini membaca file dan mengembalikan ukuran buffer, ukuran matriks, matriks, jumlah sekuens, sekuens, dan hadiah.
`def generate()`	Fungsi ini melakukan pengacakan terhadap matriks dan sekuens. Fungsi ini mengembalikan ukuran buffer, ukuran matriks, matriks, jumlah sekuens, sekuens, dan hadiah.
`def generate_path(current_buffer, index, current_path, current_coor, passed, buffer_size, paths, matrix_size, matrix, coordinate)`	Fungsi ini mencari semua kemungkinan jalan yang dimulai dari token-token pada baris pertama. Pencarian ini dilakukan dengan menggunakan algoritma brute force.
`def all_sequence(sequences, path)`	Fungsi ini mencari apakah suatu *path* atau kemungkinan sudah memiliki semua sekuens.
`def find_sequence(sequences, paths)`	Fungsi ini mencari nilai hadiah dari setiap kemungkinan jalan dan menambahkannya ke dalam suatu *array*.
`def find_optimal(maxreward, paths, coors)`	Fungsi ini mengembalikan nilai hadiah, jalan, dan koordinat yang memiliki nilai hadiah tertinggi.
`def max_length_sequence(sequences)`	Fungsi ini mencari panjang maksimum dari suatu sekuens.
`def optimize(paths, sequences, initreward, coordinates)`	Fungsi ini mencari jalan optimal dari setiap jalan dengan menghapus token akhir yang tidak mengubah nilai hadiah maksimum.
`def save_solution(file_name, max_reward, max_sequence, max_coordinates, execution_time)`	Fungsi ini menyimpan hasil output ke dalam file txt.

2.2 Alur Program

1. Tampilan awal program.

2. Program menerima inputan berupa pilihan 1, 2, atau 3. Jika memilih 1, maka program akan menerima inputan file. Jika memilih 2, maka program akan membuat matriks dan sekuens secara acak. Jika memilih 3, maka program akan berhenti. Program akan terus menerima pilihan hingga ada pilihan 3.
3. Jika memilih 2, program akan memunculkan matriks dan sekuens beserta hadiahnya. Kemudian program akan memunculkan output baik ketika memilih 1 ataupun 2.
4. Akan muncul prompt untuk menyimpan file. Jika memilih y, maka akan muncul input nama file dan kemudian di save. Jika tidak, maka file tidak akan disimpan.
5. Akan muncul lagi tampilan awal. Hingga pengguna memilih 3.

```
Cyberpunk 2077 Breach Protocol Solution
=======================================
1. Input Text File
2. Generate Matrix and Sequence
3. Exit
=======================================
Choice: 1
=======================================
Enter the file name with the game matrix: test3.txt
=======================================
20
7A BD 7A 1C
1, 1
1, 3
5, 3
5, 1
2, 1
2, 2


15.826940536499023 ms

Do you want to save this solution? (y/n): y
Input file name: save3.txt
Your file has been saved!
Cyberpunk 2077 Breach Protocol Solution
=======================================
1. Input Text File
2. Generate Matrix and Sequence
3. Exit
=======================================
Choice: 3
=======================================
=======================================
             Thank You!
=======================================
         Shazya Audrea Taufik
               13522063
```

BAB III
SOURCE CODE

3.1 *Source Code*

```
import random
import time
import os
def read_file(file_name):
    with open(file_name, 'r') as file:
        lines = file.readlines()
        buffer_size = int(lines[0])
        matrix_size = tuple(map(int, lines[1].split()))
        matrix = []
        for i in range(matrix_size[1]):
            matrix.append(lines[i+2].split())
        number_of_sequences = int(lines[2+matrix_size[1]])
        sequences = []
        rewards = []
        for i in range(3+matrix_size[1], len(lines), 2):
                        sequences.append((lines[i].replace("  ",
"")).rstrip())
            rewards.append(int(lines[i+1]))
               return    buffer_size,    matrix_size,    matrix,
number_of_sequences, sequences, rewards
def generate():
      unique_token_number  =  int(input("Input  number  of  unique
token: "))
       tokens  =  list(map(str,  input("Input  unique  token(s):
").split()))
    buffer_size = int(input("Input buffer size: "))
     matrix_size = tuple(map(int, input("Input matrix size (col
row): ").split()))
     number_of_sequences = int(input("Input number of sequence:
"))
       max_sequence_size  =  int(input("Input  maximum  size  of
sequence: "))
     matrix = [[None for j in range (matrix_size[0])] for i in
range(matrix_size[1])]
    for i in range(matrix_size[1]):
        for j in range(matrix_size[0]):
            matrix[i][j] = random.choice(tokens)
```

```
    rewards = []
    sequences = []
    for i in range(number_of_sequences):
        length = random.randint(2, max_sequence_size)
        sequence = ''
        for j in range(length):
            sequence = sequence+random.choice(tokens)
        sequences.append(sequence)
        rewards.append(random.randint(0,100))
               return    buffer_size,    matrix_size,    matrix,
number_of_sequences, sequences, rewards
def    generate_path(current_buffer,    index,    current_path,
current_coor, passed, buffer_size, paths, matrix_size, matrix,
coordinate):
                  if(current_buffer    ==    buffer_size)    or
(all_sequence(sequences, current_path) == True):
        paths.append(current_path)
        coordinate.append(current_coor)
        return None
    if (current_buffer == 0):
        for j in range(matrix_size[0]):
                           generate_path(1,  j,  matrix[0][j],
current_coor+([j+1,   1]),   [[j,   0]],   buffer_size,   paths,
matrix_size, matrix, coordinate)
    elif(current_buffer % 2 == 1):
        for i in range(matrix_size[1]):
            seen = False
            for coordinates in passed:
                  if coordinates[0] == index and coordinates[1]
== i:
                    seen = True
                    break
            if (seen == True):
                continue
            passed.append([index, i])
                           generate_path(current_buffer+1,  i,
current_path+matrix[i][index],  current_coor+([index+1,  i+1]),
passed, buffer_size, paths, matrix_size, matrix, coordinate)
            passed.pop()
```

```
    else:
        for j in range(matrix_size[0]):
            seen = False
            for coordinates in passed:
                  if coordinates[1] == index and coordinates[0]
== j:
                    seen = True
                    break
            if (seen == True):
                continue
            passed.append([j, index])
                              generate_path(current_buffer+1,  j,
current_path+matrix[index][j],  current_coor+([j+1,  index+1]),
passed, buffer_size, paths, matrix_size, matrix, coordinate)
            passed.pop()
    return paths, coordinate
def all_sequence(sequences, path):
    foundAll = 0
    for sequence in sequences:
        if sequence in path:
            foundAll += 1
    if foundAll == len(sequences):
        return True
    else:
        return False
def find_sequence(sequences, paths):
    initreward = []
    for path in paths:
        reward = 0
        for i in range(len(sequences)):
            occur = path.count(sequences[i])
            if occur >= 1:
                reward += rewards[i]
        initreward.append(reward)
    return initreward
def find_optimal(maxreward, paths, coors):
    max_num = maxreward[0]
    max_index = 0
    for i in range(len(maxreward)):
          if maxreward[i] > max_num or (maxreward[i] == max_num
```

```
and len(paths[i]) < len(paths[max_index])):
            max_num = maxreward[i]
            max_index = i
    if max_num == 0:
        paths[max_index] = ''
        coors[max_index] = ''
    return max_num, paths[max_index], coors[max_index]
def max_length_sequence(sequences):
    maxlen = -1
    for sequence in sequences:
        if(len(sequence) > maxlen):
            maxlen = len(sequence)
    return maxlen
def optimize(paths, sequences, initreward, coordinates):
    op_path = []
    op_coor = []
    for k in range(len(paths)):
        path = paths[k]
        coor = coordinates[k]
         if (len(path) >= max_length_sequence(sequences)+2) and
init_reward[k] != 0:
            temp = path[:-2]
            tempcoor = coor[:-2]
            reward = 0
            for i in range(len(sequences)):
                occur = temp.count(sequences[i])
                if occur >= 1:
                    reward += rewards[i]
            if reward == initreward[k]:
                path = temp
                coor = tempcoor
            else:
                op_path.append(path)
                op_coor.append(coor)
            while(reward == initreward[k]):
                temp = path[:-2]
                tempcoor = coor[:-2]
                reward = 0
                for i in range(len(sequences)):
                    occur = temp.count(sequences[i])
```

```
                    if occur >= 1:
                        reward += rewards[i]
                if reward == initreward[k]:
                    path = temp
                    coor = tempcoor
                else:
                    op_path.append(path)
                    op_coor.append(coor)
        else:
            op_path.append(path)
            op_coor.append(coor)
    return op_path, op_coor
def    save_solution(file_name,    max_reward,    max_sequence,
max_coordinates, execution_time):
    with open(file_name, 'w') as file:
        if (max_num == 0):
            file.write("Tidak ada solusi."+'\n')
            file.write(str(max_reward)+'\n')
            file.write("\n")
            file.write(execution_time+" ms")
        else:
            file.write(str(max_reward))
            file.write("\n")
            for i in range(len(max_sequence)):
                if i == len(max_sequence) - 1:
                    file.write(max_sequence[i])
                else:
                    if i % 2 == 1:
                        file.write(max_sequence[i]+' ')
                    else:
                        file.write(max_sequence[i])
            file.write("\n")
            for i in range(len(max_coordinates)):
                if i % 2 == 0:
                    file.write(str(max_coordinates[i])+', ')
                else:
                    file.write(str(max_coordinates[i]))
                    file.write("\n")
            file.write("\n")
            file.write(execution_time+" ms")
```

```
#main program
print("Cyberpunk 2077 Breach Protocol Solution")
print("=======================================")
print("1. Input Text File")
print("2. Generate Matrix and Sequence")
print("3. Exit")
print("=======================================")
choice = int(input("Choice: "))
print("=======================================")
stop_program = False
while(1 <= choice <= 3 and stop_program == False):
    if (1 <= choice <= 2):
        if (choice == 1):
                file_name = input("Enter the file name with the
game matrix: ")
            relative_path = "test/"+file_name
            while not os.path.isfile(relative_path):
                 file_name = input("File not found, reenter your
file name: ")
                relative_path = "test/"+file_name
                            buffer_size,  matrix_size,  matrix,
number_of_sequences,        sequences,        rewards        =
read_file(relative_path)
        else:
                            buffer_size,  matrix_size,  matrix,
number_of_sequences, sequences, rewards = generate()
            print("=======================================")
            for i in range(matrix_size[1]):
                for j in range(matrix_size[0]):
                    if (j == matrix_size[0]-1):
                        print(matrix[i][j], end='\n')
                    else:
                        print(matrix[i][j], end=' ')
            for j in range(len(sequences)):
                sequence = sequences[j]
                for i in range(len(sequence)):
                    if i == len(sequence) - 1:
                        print(sequence[i])
                        print(str(rewards[j])+"\n")
                    else:
```

```
                        if i % 2 == 1:
                            print(sequence[i], end=' ')
                        else:
                            print(sequence[i], end='')
        start_time = time.time()
          paths, coordinate = generate_path(0, 0, [], [], [],
buffer_size, [], matrix_size, matrix, [])
        init_reward = find_sequence(sequences, paths)
              op_path, op_coor = optimize(paths, sequences,
init_reward, coordinate)
             max_num, path, coor = find_optimal(init_reward,
op_path, op_coor)
        print("=======================================")
        if (max_num == 0):
            print("Tidak ada solusi.")
        print(max_num)
        for i in range(len(path)):
            if i == len(path) - 1:
                print(path[i])
            else:
                if i % 2 == 1:
                    print(path[i]+' ', end='')
                else:
                    print(path[i], end='')
        for i in range(len(coor)):
            if i % 2 == 0:
                print(str(coor[i])+', ', end='')
            else:
                print(str(coor[i]), end='\n')
        end_time = time.time()
        print("\n")
        print((end_time-start_time)*1000, "ms\n")
          save_file = input("Do you want to save this solution?
(y/n): ")
        if(save_file == 'y'):
            file_name_save = input("Input file name: ")
            relative_path_save = "test/"+file_name_save
            while os.path.isfile(relative_path_save):
                    file_name_save = input("File name is taken,
reenter your file name: ")
```

```
                relative_path_save = "test/"+file_name_save
                save_solution(relative_path_save, max_num, path,
coor, str((end_time-start_time)*1000))
            print("Your file has been saved!")
        print("========================================")
        print("Cyberpunk 2077 Breach Protocol Solution")
        print("========================================")
        print("1. Input Text File")
        print("2. Generate Matrix and Sequence")
        print("3. Exit")
        print("========================================")
        choice = int(input("Choice: "))
        print("========================================")
    else:
        print("========================================")
        print("              Thank You!                ")
        print("========================================")
        print("         Shazya Audrea Taufik           ")
        print("               13522063                 ")
        print("========================================")
        stop_program = True
```

3.2 *Source Code* (Tampilan Layar)

src > main.py > read_file

```python
import random
import time
import os

def read_file(file_name):
    with open(file_name, 'r') as file:
        lines = file.readlines()
        buffer_size = int(lines[0])
        matrix_size = tuple(map(int, lines[1].split()))
        matrix = []
        for i in range(matrix_size[1]):
            matrix.append(lines[i+2].split())
        number_of_sequences = int(lines[2+matrix_size[1]])
        sequences = []
        rewards = []
        for i in range(3+matrix_size[1], len(lines), 2):
            sequences.append((lines[i].replace(" ", "")).rstrip())
            rewards.append(int(lines[i+1]))
    return buffer_size, matrix_size, matrix, number_of_sequences, sequences, rewards

def generate():
    unique_token_number = int(input("Input number of unique token: "))
    tokens = list(map(str, input("Input unique token(s): ").split()))
    buffer_size = int(input("Input buffer size: "))
    matrix_size = tuple(map(int, input("Input matrix size (col row): ").split()))
    number_of_sequences = int(input("Input number of sequence: "))
    max_sequence_size = int(input("Input maximum size of sequence: "))

    matrix = [[None for j in range (matrix_size[0])] for i in range(matrix_size[1])]
    for i in range(matrix_size[1]):
        for j in range(matrix_size[0]):
            matrix[i][j] = random.choice(tokens)

    rewards = []
    sequences = []

    for i in range(number_of_sequences):
        length = random.randint(2, max_sequence_size)
        sequence = ''
        for j in range(length):
            sequence = sequence+random.choice(tokens)
        sequences.append(sequence)
        rewards.append(random.randint(0,100))

    return buffer_size, matrix_size, matrix, number_of_sequences, sequences, rewards
```

```python
def generate_path(current_buffer, index, current_path, current_coor, passed, buffer_size, paths, matrix_size, matrix, coordinate):
    if(current_buffer == buffer_size) or (all_sequence(sequences, current_path) == True):
        paths.append(current_path)
        coordinate.append(current_coor)
        return None
    if (current_buffer == 0):
        for j in range(matrix_size[0]):
            generate_path(1, j, matrix[0][j], current_coor+([j+1, 1]), [[j, 0]], buffer_size, paths, matrix_size, matrix, coordinate)
    elif(current_buffer % 2 == 1):
        for i in range(matrix_size[1]):
            seen = False
            for coordinates in passed:
                if coordinates[0] == index and coordinates[1] == i:
                    seen = True
                    break
            if (seen == True):
                continue
            passed.append([index, i])
            generate_path(current_buffer+1, i, current_path+matrix[i][index], current_coor+([index+1, i+1]), passed, buffer_size, paths, matrix_size, matrix, coordinate)
            passed.pop()
    else:
        for j in range(matrix_size[0]):
            seen = False
            for coordinates in passed:
                if coordinates[1] == index and coordinates[0] == j:
                    seen = True
                    break
            if (seen == True):
                continue
            passed.append([j, index])
            generate_path(current_buffer+1, j, current_path+matrix[index][j], current_coor+([j+1, index+1]), passed, buffer_size, paths, matrix_size, matrix, coordinate)
            passed.pop()
    return paths, coordinate

def all_sequence(sequences, path):
    foundAll = 0
    for sequence in sequences:
        if sequence in path:
            foundAll += 1
    if foundAll == len(sequences):
        return True
    else:
        return False

def find_sequence(sequences, paths):
    initreward = []
    for path in paths:
        reward = 0
        for i in range(len(sequences)):
            occur = path.count(sequences[i])
            if occur >= 1:
                reward += rewards[i]
        initreward.append(reward)
    return initreward
```

```python
def find_optimal(maxreward, paths, coors):
    max_num = maxreward[0]
    max_index = 0
    for i in range(len(maxreward)):
        if maxreward[i] > max_num or (maxreward[i] == max_num and len(paths[i]) < len(paths[max_index])):
            max_num = maxreward[i]
            max_index = i
    if max_num == 0:
        paths[max_index] = ''
        coors[max_index] = ''
    return max_num, paths[max_index], coors[max_index]

def max_length_sequence(sequences):
    maxlen = -1
    for sequence in sequences:
        if(len(sequence) > maxlen):
            maxlen = len(sequence)
    return maxlen
```

```python
def optimize(paths, sequences, initreward, coordinates):
    op_path = []
    op_coor = []
    for k in range(len(paths)):
        path = paths[k]
        coor = coordinates[k]
        if (len(path) >= max_length_sequence(sequences)+2) and init_reward[k] != 0:
            temp = path[:-2]
            tempcoor = coor[:-2]
            reward = 0
            for i in range(len(sequences)):
                occur = temp.count(sequences[i])
                if occur >= 1:
                    reward += rewards[i]
            if reward == initreward[k]:
                path = temp
                coor = tempcoor
            else:
                op_path.append(path)
                op_coor.append(coor)
            while(reward == initreward[k]):
                temp = path[:-2]
                tempcoor = coor[:-2]
                reward = 0
                for i in range(len(sequences)):
                    occur = temp.count(sequences[i])
                    if occur >= 1:
                        reward += rewards[i]
                if reward == initreward[k]:
                    path = temp
                    coor = tempcoor
                else:
                    op_path.append(path)
                    op_coor.append(coor)
        else:
            op_path.append(path)
            op_coor.append(coor)
    return op_path, op_coor
```

```
def save_solution(file_name, max_reward, max_sequence, max_coordinates, execution_time):
    with open(file_name, 'w') as file:
        if (max_num == 0):
            file.write("Tidak ada solusi."+'\n')
            file.write(str(max_reward)+'\n')
            file.write("\n")
            file.write(execution_time+" ms")
        else:
            file.write(str(max_reward))
            file.write("\n")
            for i in range(len(max_sequence)):
                if i == len(max_sequence) - 1:
                    file.write(max_sequence[i])
                else:
                    if i % 2 == 1:
                        file.write(max_sequence[i]+' ')
                    else:
                        file.write(max_sequence[i])
            file.write("\n")
            for i in range(len(max_coordinates)):
                if i % 2 == 0:
                    file.write(str(max_coordinates[i])+', ')
                else:
                    file.write(str(max_coordinates[i]))
                    file.write("\n")
            file.write("\n")
            file.write(execution_time+" ms")
```

```
#main program
print("Cyberpunk 2077 Breach Protocol Solution")
print("=====================================")
print("1. Input Text File")
print("2. Generate Matrix and Sequence")
print("3. Exit")
print("=====================================")
choice = int(input("Choice: "))
print("=====================================")
stop_program = False
while(1 <= choice <= 3 and stop_program == False):
    if (1 <= choice <= 2):
        if (choice == 1):
            file_name = input("Enter the file name with the game matrix: ")
            relative_path = "test/"+file_name
            while not os.path.isfile(relative_path):
                file_name = input("File not found, reenter your file name: ")
                relative_path = "test/"+file_name
            buffer_size, matrix_size, matrix, number_of_sequences, sequences, rewards = read_file(relative_path)
        else:
            buffer_size, matrix_size, matrix, number_of_sequences, sequences, rewards = generate()
            print("=====================================")
            for i in range(matrix_size[1]):
                for j in range(matrix_size[0]):
                    if (j == matrix_size[0]-1):
                        print(matrix[i][j], end='\n')
                    else:
                        print(matrix[i][j], end=' ')

            for j in range(len(sequences)):
                sequence = sequences[j]
                for i in range(len(sequence)):
                    if i == len(sequence) - 1:
                        print(sequence[i])
                        print(str(rewards[j])+"\n")
                    else:
                        if i % 2 == 1:
                            print(sequence[i], end=' ')
                        else:
                            print(sequence[i], end='')
```

```
        start_time = time.time()
        paths, coordinate = generate_path(0, 0, [], [], [], buffer_size, [], matrix_size, matrix, [])
        init_reward = find_sequence(sequences, paths)
        op_path, op_coor = optimize(paths, sequences, init_reward, coordinate)
        max_num, path, coor = find_optimal(init_reward, op_path, op_coor)
        print("=====================================")
        if (max_num == 0):
            print("Tidak ada solusi.")
        print(max_num)
        for i in range(len(path)):
            if i == len(path) - 1:
                print(path[i])
            else:
                if i % 2 == 1:
                    print(path[i]+' ', end='')
                else:
                    print(path[i], end='')
        for i in range(len(coor)):
            if i % 2 == 0:
                print(str(coor[i])+', ', end='')
            else:
                print(str(coor[i]), end='\n')
        end_time = time.time()
        print("\n")
        print((end_time-start_time)*1000, "ms\n")
        save_file = input("Do you want to save this solution? (y/n): ")
        if(save_file == 'y'):
            file_name_save = input("Input file name: ")
            relative_path_save = "test/"+file_name_save
            while os.path.isfile(relative_path_save):
                file_name_save = input("File name is taken, reenter your file name: ")
                relative_path_save = "test/"+file_name_save
            save_solution(relative_path_save, max_num, path, coor, str((end_time-start_time)*1000))
            print("Your file has been saved!")
        print("=====================================")
        print("Cyberpunk 2077 Breach Protocol Solution")
        print("=====================================")
        print("1. Input Text File")
        print("2. Generate Matrix and Sequence")
        print("3. Exit")
        print("=====================================")
        choice = int(input("Choice: "))
        print("=====================================")
    else:
        print("=====================================")
        print("              Thank You!             ")
        print("=====================================")
        print("         Shazya Audrea Taufik        ")
        print("              13522063               ")
        print("=====================================")
        stop_program = True
```

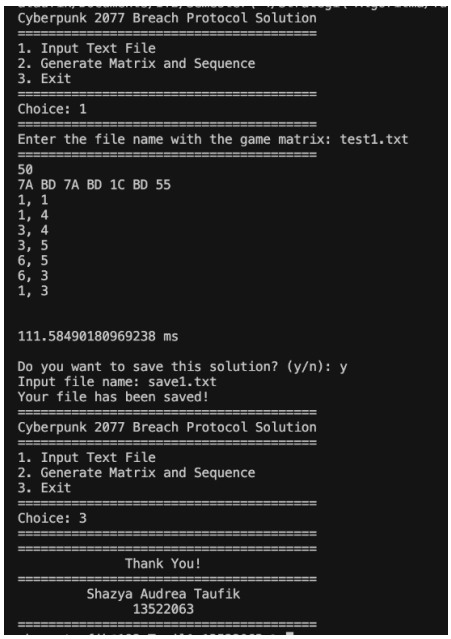
BAB IV
HASIL PENGUJIAN

4.1 Test Case 1

Text File:

```
7
6 6
7A 55 E9 E9 1C 55
55 7A 1C 7A E9 55
55 1C 1C 55 E9 BD
BD 1C 7A 1C 55 BD
BD 55 BD 7A 1C 1C
1C 55 55 7A 55 7A
3
BD E9 1C
15
BD 7A BD
20
BD 1C BD 55
30
```

Hasil:



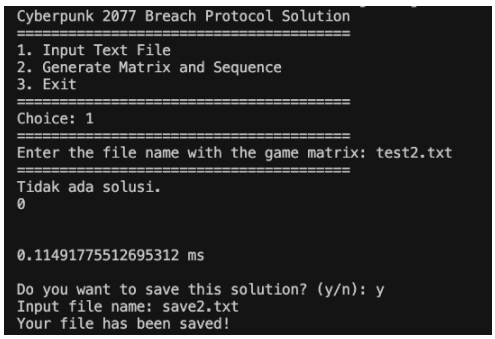
4.2 Test Case 2

Text File:

```
2
3 2
7A 55 E9
55 7A BD
```

```
1
55 BD
15
```

Hasil:

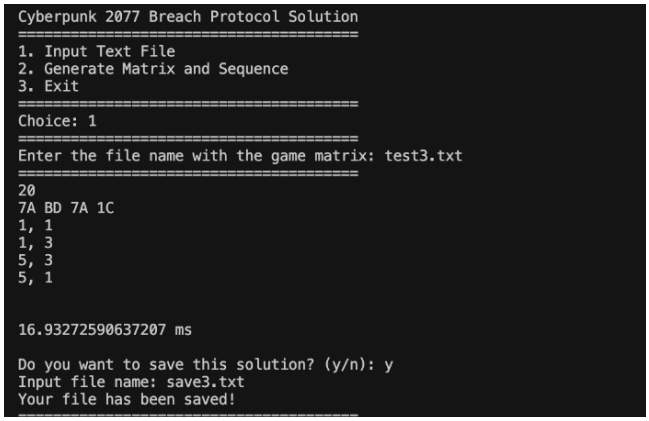


4.3 Test Case 3

Text File:

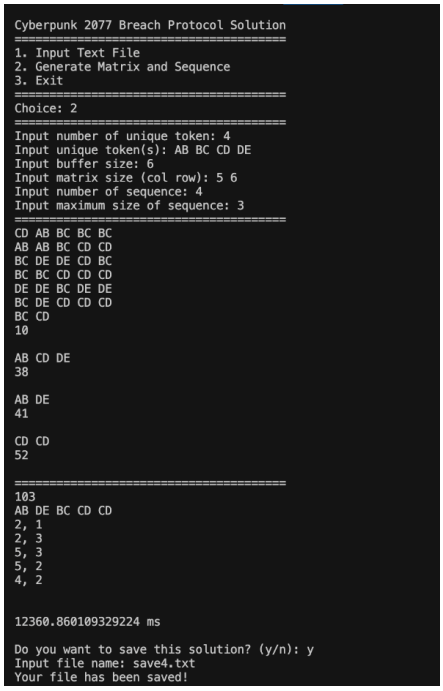
```
7
5 4
7A BD 55 E9 1C
BD 1C FF E9 E9
BD 55 E9 E9 7A
FF E9 1C E9 7A
2
7A BD 7A 1C
20
55 1C FF FF
10
```

Hasil:



4.4 Test Case 4

Hasil:



4.5 Test Case 5

Hasil:

4.6 Test Case 6

Hasil:

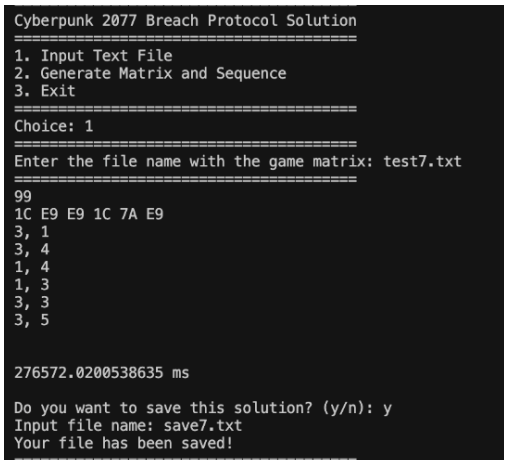
4.7 Test Case 7

Text file:

```
15
5 5
BD 1C 1C 55 E9
55 E9 1C 55 BD
1C BD 7A 7A 7A
E9 7A E9 7A 7A
55 BD E9 1C 7A
10
55 55
-53
1C E9 E9
83
7A 7A
-18
55 55
-96
55 7A
-49
BD BD
-59
7A E9
16
55 E9
-92
BD E9
-20
```

```
1C BD
-67
```

Hasil:



BAB V
LAMPIRAN

5.1 Repository

https://github.com/zyaaa-aaa/Tucil1_13522063.git

5.2 Tabel Kelengkapan

Poin	Ya	Tidak
1. Program berhasil dikompilasi tanpa kesalahan	☑	☐
2. Program berhasil dijalankan	☑	☐
3. Program dapat membaca masukan berkas .txt	☑	☐
4. Program dapat menghasilkan masukan secara acak	☑	☐
5. Solusi yang diberikan program optimal	☑	☐
6. Program dapat menyimpan solusi dalam berkas .txt	☑	☐
7. Program memiliki GUI	☐	☑