

# LAPORAN TUGAS KECIL 3

## IF2211 STRATEGI ALGORITMA

Penyelesaian *Word Search Puzzle* dengan Algoritma *Brute Force*



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PROGRAM STUDI TEKNIK INFORMATIKA  
SEKOLAH TEKNIK ELEKTRO DAN INFORMATIKA  
INSTITUT TEKNOLOGI BANDUNG  
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## A. ALGORITMA BRANCH AND BOUND

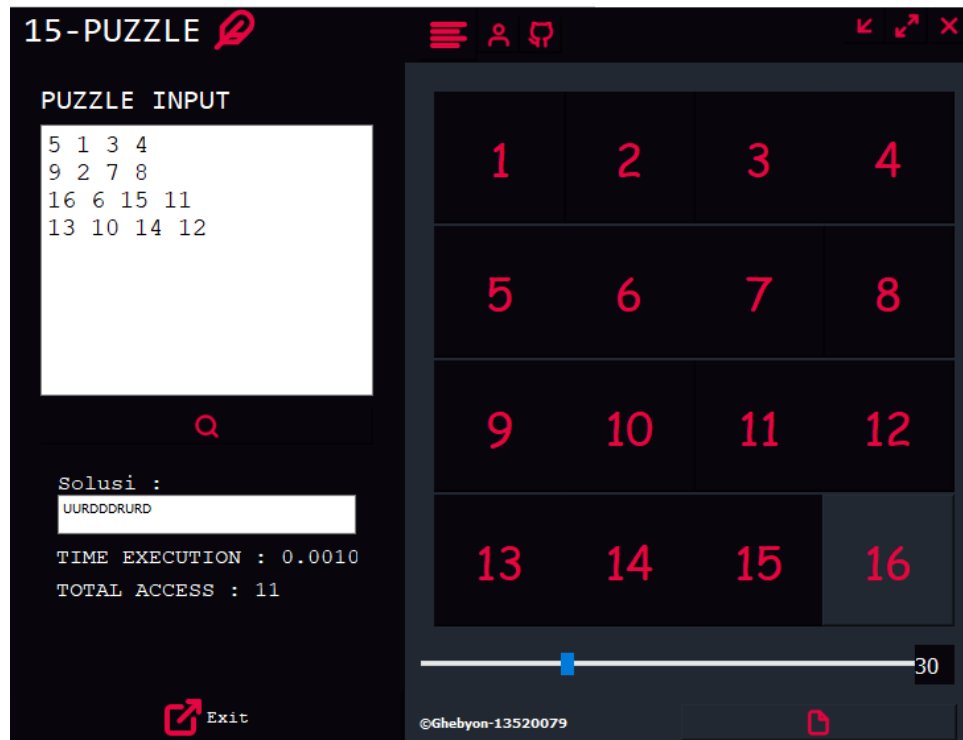
1. Sediakan list notVisited dan list visited.
2. Input suatu Puzzle dan dijadikan sebagai root Puzzle. Masukkan root Puzzle ke dalam list notVisited
3. Untuk setiap Puzzle pada list notVisited, hitung costnya dengan heuristik  
$$c(x) = f(x) + g(x)$$

Keterangan :

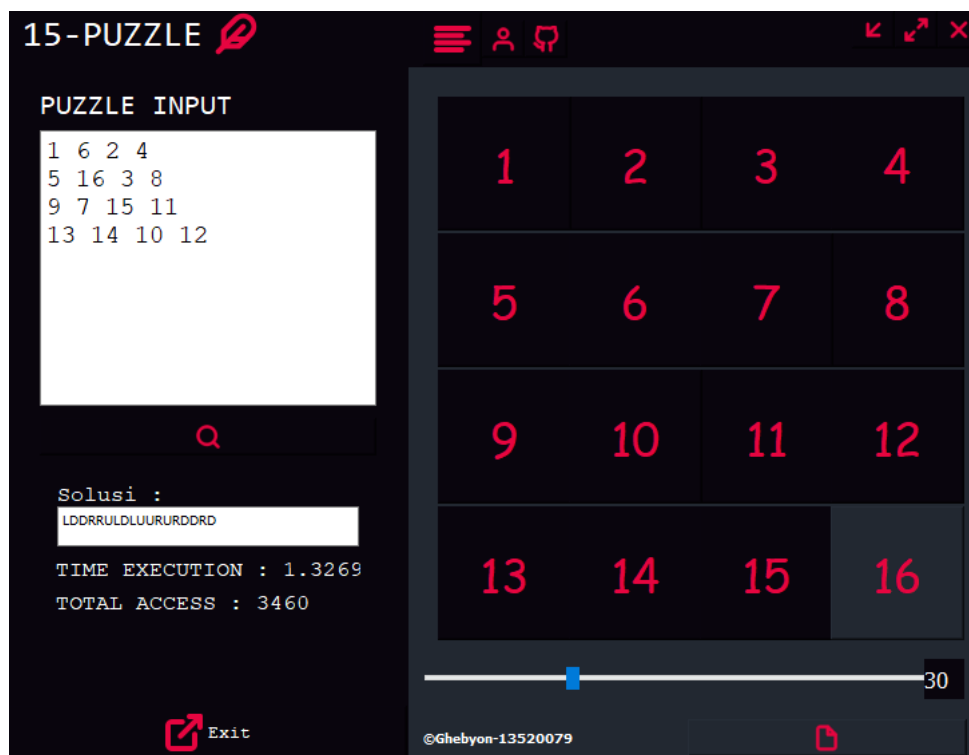
  - $c(x)$  = cost untuk simpul x
  - $f(x)$  = cost untuk mencapai simpul x dari akar
  - $g(x)$  = taksiran panjang lintasan terpendek dari P ke simpul solusi

Pilih Puzzle dengan cost terendah sebagai currentPuzzle
4. Periksa apakah puzzle merupakan solusi atau tidak
  - 3.1 Jika ya, maka pencarian dihentikan
  - 3.2 Jika tidak, lanjutkan
5. Tentukan pergerakan selanjutnya yang memungkinkan. Syarat pergerakan yang memungkinkan :
  - Slot kosong pada puzzle bergerak ke arah kiri, kanan, atas, atau bawah.
  - Pergerakan tersebut tidak menghasilkan Puzzle yang sudah pernah dikunjungi (tidak terdapat pada list visited)
6. Hapus currentPuzzle dari list notVisited dan masukkan ke dalam listVisited
7. Kembali ke langkah 2

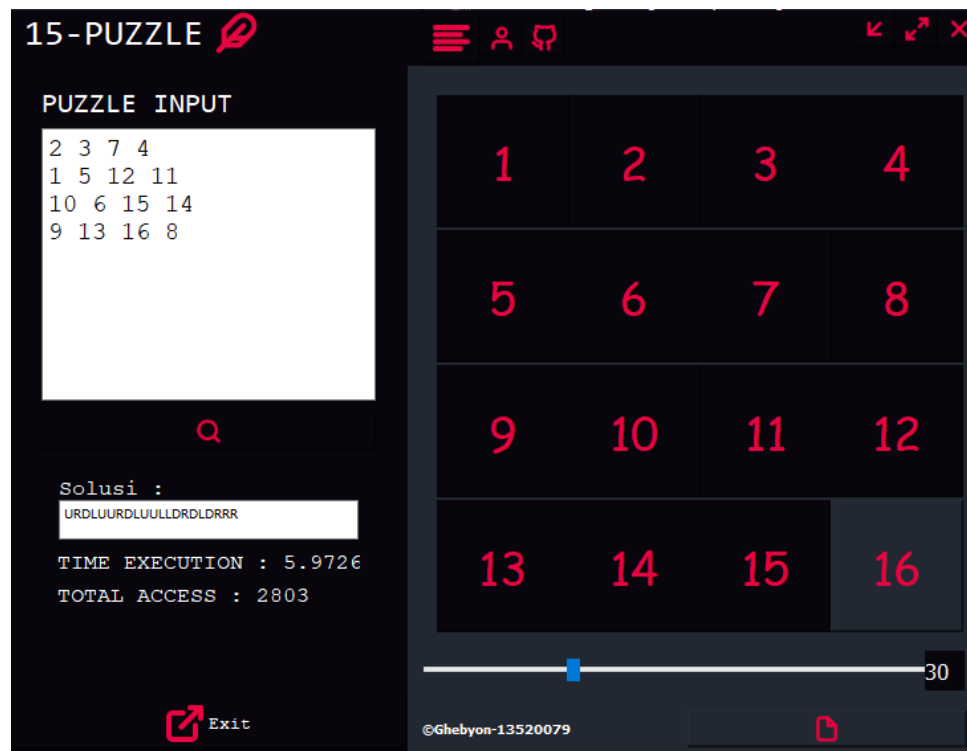
## B. INPUT DAN OUTPUT



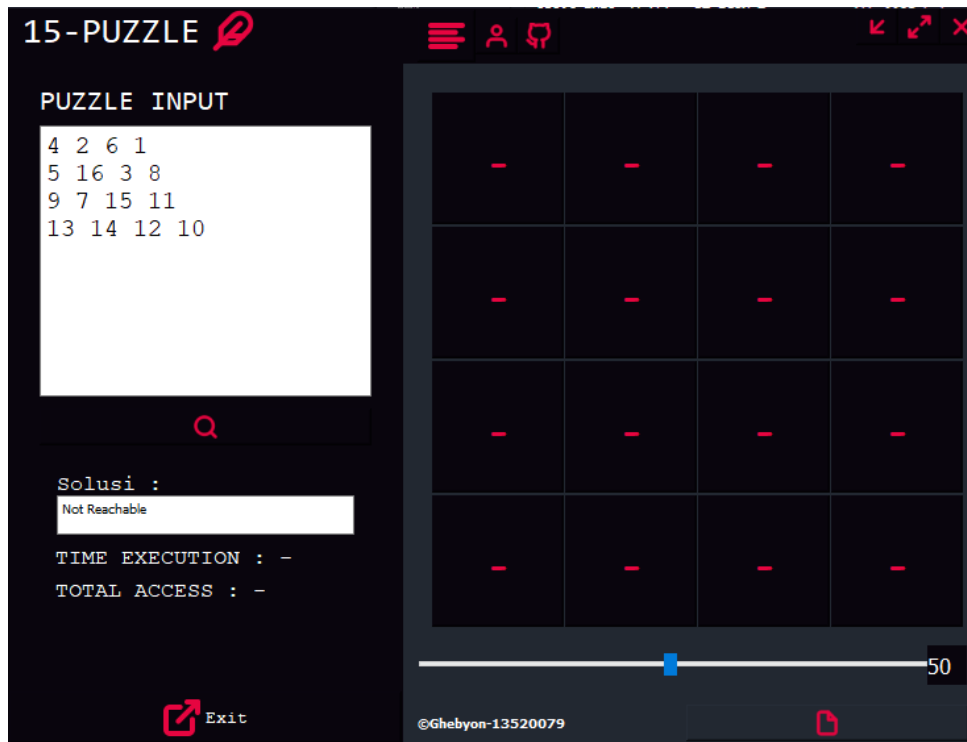
Gambar 1 Test Case Reachable 1



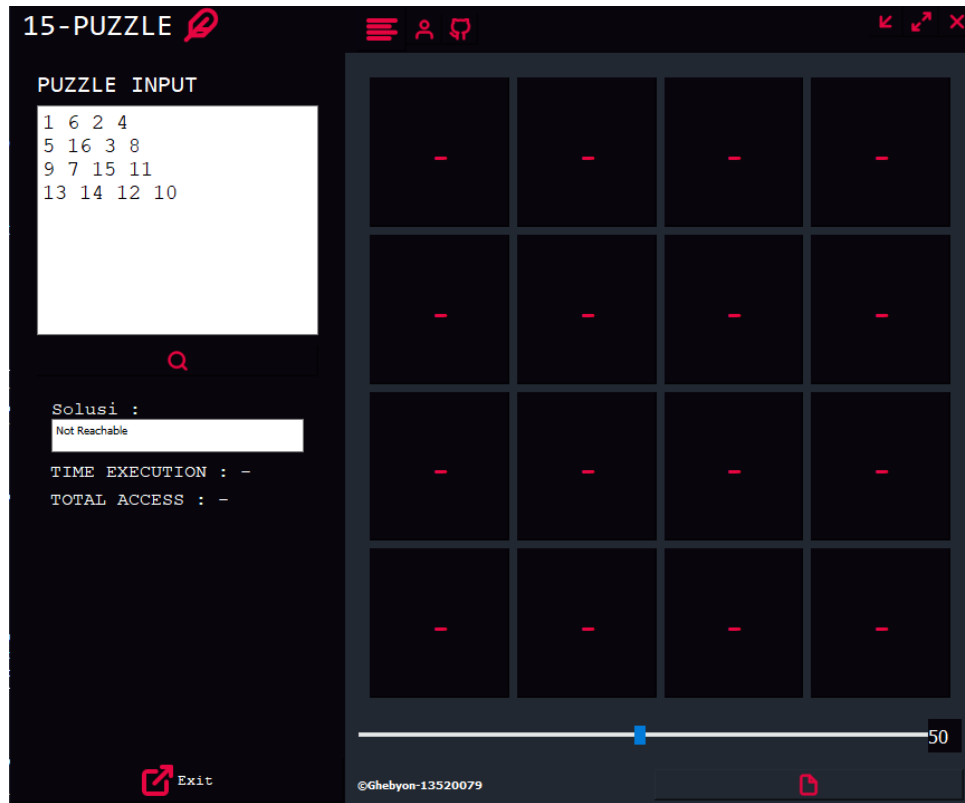
Gambar 2 Test Case Reachable 2



Gambar 3 Test Case Reachable 3



Gambar 4 Test Case Not Reachable 1



*Gambar 5 Test Case Not Reachable 2*

### C. GITHUB

<https://github.com/ghebyon/Tucil03-13520079>

### D. PENILAIAN MANDIRI

Poin	Ya	Tidak
1. Program berhasil dikompilasi	✓	
2. Program berhasil running	✓	
3. Program dapat menerima input dan menuliskan output	✓	
4. Luaran sudah benar untuk semua data uji	✓	
5. Bonus dibuat	✓	

## E. KODE PROGRAM

### KELAS PUZZLE

```
class Puzzle:
    def __init__(self, level : int, puzzle : List, solusi):
        self.level = level
        self.puzzle = puzzle
        g_cost = 0
        for i in range(16):
            if(self.puzzle[i] != i+1 and self.puzzle[i] != 16):
                g_cost += 1
        self.cost = self.level + g_cost
        self.solusi = solusi      #List of Char : 'L', 'R', 'U', 'D'

    def reachable(self):
        count = 0
        for i in range(15):
            for j in range(i+1,16,1):
                if(self.puzzle[j] < self.puzzle[i]):
                    count += 1
        for i in range(15):
            if(self.puzzle[i] == 16 and i in [1,3,4,6,9,11,12,14]):
                count += 1
        if(count%2 == 0):
            return True
        else:
            return False

    def possibleMove(self):
        moveSet = ['L', 'U', 'D', 'R']
        blankPos = -1
        for i in range(16):
            if (self.puzzle[i] == 16):
                blankPos = i
                if (i%4 == 0):
                    moveSet.remove('L')
                if (i//4 == 0):
                    moveSet.remove('U')
                if (i//4 == 3):
```

```

        moveSet.remove('D')
        if ((i+1)%4 == 0):
            moveSet.remove('R')
move_puzzle = {}
for move in moveSet:
    tempPuzzle = self.puzzle[:]
    if(move == 'L'):
        tempValue = tempPuzzle[blankPos]
        tempPuzzle[blankPos] = tempPuzzle[blankPos-1]
        tempPuzzle[blankPos-1] = tempValue
    if(move == 'U'):
        tempValue = tempPuzzle[blankPos]
        tempPuzzle[blankPos] = tempPuzzle[blankPos-4]
        tempPuzzle[blankPos-4] = tempValue
    if(move == 'D'):
        tempValue = tempPuzzle[blankPos]
        tempPuzzle[blankPos] = tempPuzzle[blankPos+4]
        tempPuzzle[blankPos+4] = tempValue
    if(move == 'R'):
        tempValue = tempPuzzle[blankPos]
        tempPuzzle[blankPos] = tempPuzzle[blankPos+1]
        tempPuzzle[blankPos+1] = tempValue
    move_puzzle.update({move : tempPuzzle})
return move_puzzle

def isSolution(self):
    for i in range(16):
        if(self.puzzle[i] != i+1):
            return False
    return True

```

## ALGORITMA BRANCH AND BOUND

```

def BranchnBound(notVisited : list): #parameter berisi list of object
Puzzle
    if(len(notVisited) > 0):
        visited = []
        countAccess = 0

```



```

while(True):
    greaterLevel = notVisited[0].level
    min = notVisited[0].cost
    idxPuzzleMinCost = 0
    for i in range (len(notVisited)):
        if min > notVisited[i].cost:
            min = notVisited[i].cost
            greaterLevel = notVisited[i].level
            idxPuzzleMinCost = i
        elif min == notVisited[i].cost:
            if greaterLevel < notVisited[i].level:
                min = notVisited[i].cost
                greaterLevel = notVisited[i].level
                idxPuzzleMinCost = i
    countAccess += 1
    a = 0
    for i in notVisited[idxPuzzleMinCost].puzzle:
        if i==16:
            print(0,"\t", end="")
        else:
            print(i,"\t", end="")
        if ((a+1)%4 == 0):
            print()
        a += 1
    print("COST IS: ",notVisited[idxPuzzleMinCost].cost, ",
LEVEL IS:", notVisited[idxPuzzleMinCost].level)
    if (notVisited[idxPuzzleMinCost].isSolution()):
        finalSolution = notVisited[idxPuzzleMinCost].solusi
        return countAccess, finalSolution
    else:
        dictPossibleMove =
notVisited[idxPuzzleMinCost].possibleMove()
        for items in dictPossibleMove.items():
            if(items[1] not in visited):
                newLevel = notVisited[idxPuzzleMinCost].level +
1
                newSolution =
notVisited[idxPuzzleMinCost].solusi + items[0]
                newPuzzle =

```

```
Puzzle(newLevel, items[1], newSolution)
        notVisited.append(newPuzzle)
    trashPuzzle = notVisited.pop(idnPuzzleMinCost)
    visited.append(trashPuzzle.puzzle)
```

## F. TEST CASE

Reachable 1

<b>5 1 3 4</b>
<b>9 2 7 8</b>
<b>16 6 15 11</b>
<b>13 10 14 12</b>

Reachable 2

<b>1 6 2 4</b>
<b>5 16 3 8</b>
<b>9 7 15 11</b>
<b>13 14 10 12</b>

Reachable 3

<b>2 3 7 4</b>
<b>1 5 12 11</b>
<b>10 6 15 14</b>
<b>9 13 16 8</b>

Not Reachable 1

<b>4 2 6 1</b>
<b>5 16 3 8</b>
<b>9 7 15 11</b>
<b>13 14 12 10</b>

Not Reachable 2

<b>1 6 2 4</b>
<b>5 16 3 8</b>
<b>9 7 15 11</b>
<b>13 14 12 10</b>