TUGAS KECIL

Implementasi Algoritma Brute Force dalam Penyelesaian Word Search Puzzle

LAPORAN

Diajukan sebagai salah satu tugas mata kuliah IF2211 Strategi Algoritma pada

Semester II

Tahun Akademik 2021-2022

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2022

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BAB I. ALGORITMA BRUTE FORCE

Dalam tugas kecil ini, algoritma *brute force* diimplementasikan dalam pencarian katakata yang ada dalam permainan *word search puzzle*. *Puzzle* disimpan dalam bentuk matriks karakter, sementara kata kunci disimpan ke dalam sebuah *list*. Algoritma *brute force* akan mencari keberadaan sebuah kata dalam *puzzle* dengan pencocokan karakter pertama dari kata kunci yang hendak dicari dengan karakter yang ada di dalam *puzzle* secara sekuensial. Apabila ditemukan karakter yang sesuai dengan karakter pertama kata kunci, maka pencarian dilanjutkan dengan mencocokkan karakter-karakter lain dengan karakter di kata kunci.

Pencocokan dilakukan terhadap delapan arah: ke arah kanan, ke arah kiri, ke arah atas, ke arah bawah, ke arah diagonal atas kiri, ke arah diagonal atas kanan, ke arah diagonal bawah kiri, dan ke arah diagonal bawah kanan. Sebelum melakukan pencocokan, program akan melakukan pengecekan apakah panjang kata kunci melebihi dimensi matriks *puzzle*.

Apabila panjang kata kunci yang hendak dicek sesuai arah melebihi dimensi matriks *puzzle* (akan menyebabkan *out of bounds*), maka pengecekan ke arah tersebut tidak akan dilakukan dan program akan melakukan pengecekan ke arah lainnya. Sebaliknya, apabila panjang kata kunci tidak menyebabkan *out of bounds*, maka pengecekan akan dilakukan. Pengecekan akan dihentikan apabila ditemukan satu karakter di arah tersebut yang tidak cocok. Jika pengecekan yang dilakukan berhasil, maka pencarian akan dihentikan dan program akan memberikan keluaran berupa arah yang ditemukan, jumlah perbandingan yang dilakukan, dan waktu yang dibutuhkan untuk melakukan perbandingan. Setelah semua kata kunci dicocokkan, program akan memberikan keluaran berupa matriks awal dengan kata kunci yang di-*highlight* untuk menandai posisi kata kunci di dalam *puzzle*.

Algoritma pencocokan dilakukan dengan mencocokkan karakter pertama di kata kunci dengan tiap karakter di matriks secara sekuensial. Apabila ditemukan karakter di matriks yang sama dengan karakter pertama kata kunci yang hendak dicari, fungsi-fungsi tersebut akan dipanggil. Fungsi menerima argumen berupa matriks *puzzle*, kata kunci yang telah dipisah dalam bentuk *array*, dan koordinat dimana karakter pertama ditemukan. Setiap fungsi akan melakukan pengecekan sesuai arah. Dengan menggunakan skema pencarian menggunakan *boolean*, fungsi akan melakukan pencocokan per karakter sampai *out of bounds*. Apabila ada satu karakter yang tidak cocok, pencarian akan berhenti dan fungsi akan mengembalikan Exec

dengan flag bernilai false. Sebaliknya, apabil pencocokan berhasil secara keseluruhan, maka program akan melakukan perubahan terhadap elemen matriks yang dicek. Nilai variabel colorChar dalam elemen charObj dalam matriks akan diubah menjadi karakter berwarna sesuai dengan nilai koordinat dan panjang kata yang dicek menggunakan kode ANSI. Pada akhir program, matriks yang akan ditampilkan adalah matriks dengan variabel colorChar yang telah berwarna.

Compiler Java bersifat just-in-time, dan karena itu, pemanggilan instansi pertama akan mengambil waktu lebih lama. Oleh karena itu, untuk membuat hasil pengukuran yang lebih akurat, program akan memanggil instansi search terlebih dahulu sebelum melakukan iterasi. Pemanggilan dilakukan dengan mengecek kata pertama di daftar kata kunci dengan indeks -1. Indeks -1 menandakan bahwa runtime hanya untuk melakukan pemanggilan instansi, sehingga pada saat melakukan iterasi, waktu yang diperoleh lebih akurat dan tidak menghitung waktu pemanggilan instansi.

BAB II. SOURCE PROGRAM DALAM BAHASA JAVA 2.1 CharObj,java

```
public class CharObj{

String oriChar;
String colorChar;

public CharObj(String character){
    this.oriChar = character;
    this.colorChar = character;
}
```

2.2 Exec.java

```
public class Exec {
    int count;
    boolean flag;
    public Exec(int compCount, boolean flag, String[] keyword, int i, int j){
        this.count = compCount;
        this.flag = flag;
    }
}
```

2.3 MainProgram.java

```
import java.util.Scanner;
import java.util.ArrayList;
public class MainProgram {
    public static void main(String[] args){
       long duration = 0;
       long count = 0;
       long[] results;
       Matrix m = new Matrix(100, 100);
       ArrayList<String> keywords = new ArrayList<String>();
       Scanner sc = new Scanner(System.in);
       System.out.println(" ___
       System.out.println("/ __\\/ \\ /\\/_ \\/_ \\/ __// _
\\/ _\\/ \\/\\/\");
       System.out.println("| \\/|| | || / / / /| \\ | /
\\|| \\/|| / | |_||");
       System.out.println("| __/| \\_/| /_/ /_| /_ | |-||| /| \\_
| | ||");
       System.out.println("\\_/ \\__/\\__/\\__/\\__/\\__/
\\|\\_/\\_\\\\___/\\_/ \\|");
       System.out.println();
       System.out.println("Welcome to the Puzzearch solver!");
       ReadFile.readText(m, keywords, sc);
       System.out.println("Read puzzle from the file: (Size: " + m.rows + " x
" + m.cols + ")");
       m.printOriMatrix();
       System.out.println("\nThere are " + keywords.size() +" read keywords
from the file: ");
       for(int i = 0; i < keywords.size(); i++){</pre>
           System.out.println("- " + keywords.get(i));
       System.out.println("Press any key to start searching!");
       sc.nextLine();
       SearchWord.search(m, keywords.get(0), -1);
       for(int i = 0; i < keywords.size(); i++){</pre>
```

```
results = SearchWord.search(m, keywords.get(i), i);
    duration += results[0];
    count += results[1];
}

m.printColorMatrix();
    System.out.println();
    System.out.println("Comparison time in total (parsing excluded): " );
    System.out.println(duration + " ns (" + String.format("%.3f",
    (double)(duration / 10e5)) + " ms)");
        System.out.println("Comparison count in total: " + count + "
time(s)");
        System.out.println("Press any key to quit...");
        sc.nextLine();
    }
}
```

2.4 Matcher.java

```
public class Matcher {
    public static Exec checkHL(Matrix m, String[] keyword, int i, int j){
        boolean flag = true;
        int compCount = 0;
        Exec tempExec;
        if (j + 1 - keyword.length < 0){
            flag = false;
        } else {
            while (count < keyword.length && flag){</pre>
                compCount++;
                if (!m.buffer[i][j - count].oriChar.equals(keyword[count])){
                    flag = false;
                    count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
                m.buffer[i][j - a].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i][j - a].oriChar + "\u001B[0m";
                a++;
```

```
tempExec = new Exec(compCount, flag);
       return tempExec;
    public static Exec checkHR(Matrix m, String[] keyword, int i, int j){
       boolean flag = true;
       int compCount = 0;
       Exec tempExec;
        if (j + keyword.length > m.cols){
            flag = false;
            int count = 1;
            while (count < keyword.length && flag){</pre>
                                            if (!m.buffer[i][j +
                compCount++;
count].oriChar.equals(keyword[count])){
                    flag = false;
                    count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
                m.buffer[i][j + a].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i][j + a].colorChar + "\u001B[0m";
                a++;
       tempExec = new Exec(compCount, flag);
       return tempExec;
    public static Exec checkVU(Matrix m, String[] keyword, int i, int j){
//vertical upper
       boolean flag = true;
       int compCount = 0;
       Exec tempExec;
        if (i - keyword.length + 1 < 0){</pre>
```

```
flag = false;
        } else {
            int count = 1;
            while (count < keyword.length && flag){</pre>
                compCount++;
                if (!m.buffer[i - count][j].oriChar.equals(keyword[count])){
                    flag = false;
                    count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
                m.buffer[i - a][j].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16* i) + (16*j) + 19) % 185) + 20) + "m" + m.buffer[i -
a][j].oriChar + "\u001B[0m";
                a++;
        tempExec = new Exec(compCount, flag);
        return tempExec;
    public static Exec checkVL(Matrix m, String[] keyword, int i, int j){
        boolean flag = true;
        int compCount = 0;
        Exec tempExec;
        if (i + keyword.length > m.rows){
            flag = false;
            while (count < keyword.length && flag){</pre>
                compCount++;
                if (!m.buffer[i + count][j].oriChar.equals(keyword[count])){
                    flag = false;
                    count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
```

```
m.buffer[i + a][j].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i + a][j].oriChar + "\u001B[0m";
               a++;
        tempExec = new Exec(compCount, flag);
       return tempExec;
    public static Exec checkDLU(Matrix m, String[] keyword, int i, int j){
//diagonal left upper
       boolean flag = true;
        int compCount = 0;
        Exec tempExec;
        if (j + 1 - keyword.length < 0 || i - keyword.length + 1 < 0){}
           flag = false;
            int count = 1;
           while (count < keyword.length && flag){</pre>
                compCount++;
               if (!m.buffer[i - count][j -
count].oriChar.equals(keyword[count])){
                    flag = false;
                    count++;
        if(flag){
            int a = 0;
           while (a < keyword.length){</pre>
               m.buffer[i - a][j - a].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i - a][j - a].oriChar + "\u001B[0m";
               a++;
        tempExec = new Exec(compCount, flag);
        return tempExec;
    public static Exec checkDLL(Matrix m, String[] keyword, int i, int j){
       boolean flag = true;
```

```
int compCount = 0;
        Exec tempExec;
        if (j + 1 - keyword.length < 0 || i + keyword.length > m.rows){
            flag = false;
        } else {
            int count = 1;
            while (count < keyword.length && flag){</pre>
                compCount++;
                if (!m.buffer[i + count][j -
count].oriChar.equals(keyword[count])){
                    flag = false;
                } else {
                    count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
                m.buffer[i + a][j - a].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i + a][j - a].oriChar + "\u001B[0m";
                a++;
        tempExec = new Exec(compCount, flag);
        return tempExec;
    public static Exec checkDRU(Matrix m, String[] keyword, int i, int j){
//diagonal right upper
        boolean flag = true;
        int compCount = 0;
        Exec tempExec;
        if (j + keyword.length > m.cols || i - keyword.length + 1 < 0){</pre>
            flag = false;
            int count = 1;
            while (count < keyword.length && flag){</pre>
                compCount++;
                if (!m.buffer[i - count][j +
count].oriChar.equals(keyword[count])){
                    flag = false;
                } else {
```

```
count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
                m.buffer[i - a][j + a].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i - a][j + a].oriChar + "\u001B[0m";
        tempExec = new Exec(compCount, flag);
       return tempExec;
    public static Exec checkDRL(Matrix m, String[] keyword, int i, int j){
//diagonal right lower
       boolean flag = true;
        int compCount = 0;
        Exec tempExec;
        if (j + keyword.length > m.cols || i + keyword.length > m.rows){
            flag = false;
            int count = 1;
            while (count < keyword.length && flag){</pre>
                compCount++;
                if (!m.buffer[i + count][j +
count].oriChar.equals(keyword[count])){
                    flag = false;
                    count++;
        if(flag){
            int a = 0;
            while (a < keyword.length){</pre>
                m.buffer[i + a][j + a].colorChar = "\u001B[1m\u001B[38;5;" +
(((keyword.length + (16 * i) + (16 * j) + 19) % 185) + 20) + "m" +
m.buffer[i + a][j + a].oriChar + "\u001B[0m";
              a++;
```

```
}
}
tempExec = new Exec(compCount, flag);
return tempExec;
}
```

2.5 Matrix.java

```
public class Matrix {
    CharObj buffer[][];
    public Matrix(int row, int col){
        this.rows = row;
        this.cols = col;
        this.buffer = new CharObj[row][col];
        for(int i = 0; i < this.rows; i++){</pre>
             for(int j = 0; j < this.cols; <math>j++){
                 this.buffer[i][j] = new CharObj(" ");
    public void printOriMatrix(){
        for(int i = 0; i < this.rows; i++){</pre>
             for(int j = 0; j < this.cols; j++){</pre>
                 System.out.print(this.buffer[i][j].oriChar + " ");
            System.out.println();
    public void printColorMatrix(){
        for(int i = 0; i < this.rows; i++){</pre>
            for(int j = 0; j < this.cols; <math>j++){
                 System.out.print(this.buffer[i][j].colorChar + " ");
            System.out.println();
```

2.6 SearchWord.java

```
public class SearchWord {
    public static long[] search(Matrix m, String keyword, int index){
        String[] keyArr = keyword.split("");
        String first = keyArr[0];
        boolean found = false;
        int i = 0;
        int j = 0;
        int count = 0;
        long time = 0;
        long tempStart = System.nanoTime();
        while (i < m.rows && !found){</pre>
            while (j < m.cols && !found){</pre>
                if (first.equals(m.buffer[i][j].oriChar)){
                    Exec temp = Matcher.checkHR(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1){
                            time = System.nanoTime() - tempStart;
                              System.out.println("Keyword \'" +
"\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %
185) + 20) + "m" + keyword + "\u001B[0m\' found horizontally right!");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
                    temp = Matcher.checkDRL(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1){
                            time = System.nanoTime() - tempStart;
                            System.out.println("Keyword \'" +
"\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %
185) + 20) + "m" + keyword + "\u001B[0m\' found diagonally! (right lower)");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
```

```
temp = Matcher.checkVL(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1){
                            time = System.nanoTime() - tempStart;
                              System.out.println("Keyword \'" +
"\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %
185) + 20) + "m" + keyword + "\u001B[0m\' found vertically lower!");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
                    temp = Matcher.checkDLL(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1){
                            time = System.nanoTime() - tempStart;
                              System.out.println("Keyword \'" +
\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %]
185) + 20) + "m" + keyword + "\u001B[0m\' found diagonally! (left lower)");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
                    temp = Matcher.checkHL(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1){
                            time = System.nanoTime() - tempStart;
                              System.out.println("Keyword \'" +
"\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %
185) + 20) + "m" + keyword + "\u001B[0m\' found horizontally left!");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
```

```
temp = Matcher.checkDLU(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1){
                            time = System.nanoTime() - tempStart;
                              System.out.println("Keyword \'" +
"\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %
185) + 20) + "m" + keyword + "\u001B[0m\' found diagonally! (left upper)");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
                    temp = Matcher.checkVU(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1 ){
                            time = System.nanoTime() - tempStart;
                              System.out.println("Keyword \'" +
\u001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %]
185) + 20) + "m" + keyword + "\u001B[0m\' found vertically upper!");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
                    temp = Matcher.checkDRU(m, keyArr, i, j);
                    if (!found){
                        count += temp.count;
                        if (temp.flag && index != -1 && !found){
                            time = System.nanoTime() - tempStart;
                               System.out.println("Keyword \'" +
\u0001B[1m\u001B[38;5;" + (((keyArr.length + (16 * i) + (16 * j) + 19) %]
185) + 20) + "m" + keyword + "\u001B[0m\' found diagonally! (right upper)");
                            System.out.println("Comparison: " + count + "
time(s) | " + time + " ns (" + String.format("%.3f", (double)(time / 10e5)) +
" ms)");
                            found = true;
```

2.7 ReadFile.java

```
import java.io.File;
import java.io.FileNotFoundException;
import java.util.Scanner;
import java.util.ArrayList;
public class ReadFile{
   public static void readText(Matrix m, ArrayList<String> keywords, Scanner
sc){
        String filename = "";
        System.out.print("Input your filename (without .txt): ");
        filename = sc.nextLine();
        while (filename == "" || !(new File("../test/" + filename +
".txt").exists())){
            System.out.println("Sorry, file name doesn't exist or it has not
been put in the /test folder!");
            System.out.print("Input your filename (without .txt): ");
            filename = sc.nextLine();
        try{
            File text = new File("../test/" + filename + ".txt");
            Scanner sizeReader = new Scanner(text);
           int rowSize = 1;
```

```
while (sizeReader.hasNextLine() &&
!sizeReader.nextLine().equals("")){
                rowSize++;
            sizeReader.close();
            Scanner lineReader = new Scanner(text);
            m.cols = 0;
            try{
                for(int i = 0; i < m.rows; i++){
                    String line = lineReader.nextLine();
                    String rows[] = line.split(" ");
                    if (m.cols < rows.length){</pre>
                        m.cols = rows.length;
                    for(int j = 0; j < rows.length; j++){</pre>
                        m.buffer[i][j] = new CharObj(rows[j]);
                    if (rows.length < m.cols){</pre>
                        for(int j = rows.length + 1; j < m.cols; j++){</pre>
                            m.buffer[i][j] = new CharObj(" ");
                lineReader.nextLine();
                while(lineReader.hasNextLine()){
                    String kw = lineReader.nextLine();
                    keywords.add(kw);
            } finally {
                lineReader.close();
        } catch (FileNotFoundException e){
            System.out.println("File not found!");
            e.printStackTrace();
```

BAB III. PENGUJIAN (INPUT/OUTPUT)

3.1 Pengujian terhadap file small1.txt (ukuran 14 x 12)

```
NATSHKAZAKBA
                                                                                    Welcome to the Puzzearch solver!
Input your filename (without .txt): small1
Read puzzle from the file: (Size: 14 x 12)
N A T S H K A Z A K B A
O I I V F R S K U D E I
L M P B U U E X B T L V
U S Y H R I T A L Y G T
X P A A K E R L A A I A
E T L N Q Z S I I I U L
M E X Q M B K K C T M B
B B U L G A R I A A L T
O T O K V O R C H O X Y
U E E O W W U I R R U V
R Z L X R T L J N C F T
G S L Y A I N E V O L S
A S D G E D A S G E W D
S A S D E W K C D S U D
                                                                                     Welcome to the Puzzearch solver!
           OIIVFRSKUDEI
           LMPBUUEXBTLV
           {\tt U} \; {\tt S} \; {\tt Y} \; {\tt H} \; {\tt R} \; {\tt I} \; {\tt T} \; {\tt A} \; {\tt L} \; {\tt Y} \; {\tt G} \; {\tt T}
           XPAAKERLAAIA
           ETLNQZSIIIUL
           MEXQMBKKCTMB
           BBULGARIAALT
           0 T O K V O R C H O X Y
           UEEOWWUIRRUV
           RZLXRTLJNCFT
           GSLYAINEVOLS
           A S D G E D A S G E W D
           SASDEWKCDSUD
           BELARUS
                                                                                     There are 12 read keywords from the file:
- BELARUS
           ITALY
           SANMARINO
                                                                                      ITALY
SANMARINO
           BELGIUM
                                                                                      BELGIUM
KAZAKHSTAN
           KAZAKHSTAN
           SERBIA
                                                                                      SERBIA
LATVIA
           LATVIA
           SLOVAKIA
                                                                                      SLOVAKIA
BULGARIA
           BULGARIA
           SLOVENIA
                                                                                      CROATIA
           CROATTA
                                                                                      LUXEMBOURG
           LUXEMBOURG
                                                                                      ess any key to start searching!
    Gambar 3.1.1 Isian berkas small1.txt
                                                                             Gambar 3.1.2 Hasil pembacaan file masukan
 Keyword 'BELARUS' found diagonally! (right upper)
Comparison: 116 time(s) | 63100 ns (0.063 ms)
                                                                       N A T S H K A Z A K <mark>B</mark> A
                                                                       0
                                                                          IIVFRSKUDEI
 Keyword 'ITALY' found horizontally right!
Comparison: 55 time(s) | 278500 ns (0.279 ms)
                                                                          MPBUUEXBTLV
                                                                       USYHRITALY<mark>G</mark>T
 Keyword 'SANMARINO' found diagonally! (right lower)
Comparison: 51 time(s) | 267000 ns (0.267 ms)
                                                                       X P A A K E R L A A I A
                                                                          TLNQZSIIIUL
 Keyword 'BELGIUM' found vertically lower!
Comparison: 17 time(s) | 292800 ns (0.293 ms)
                                                                       мехомвккстмв
                                                                       BBULGARIAALT
 Keyword 'KAZAKHSTAN' found horizontally left!
Comparison: 22 time(s) | 274800 ns (0.275 ms)
                                                                          TOKVORCHOXY
                                                                       UEEOWWUIRRUV
 Keyword 'SERBIA' found diagonally! (left upper)
Comparison: 89 time(s) | 299900 ns (0.300 ms)
                                                                          ZLXRTLJNCFT
                                                                          SLYAINEVOLS
 Keyword 'LATVIA' found vertically upper!
Comparison: 103 time(s) | 337900 ns (0.338 ms)
                                                                          SDGEDASGEWD
                                                                       SASDEWKCDSUD
 Keyword 'SLOVAKIA' found diagonally! (right upper)
Comparison: 152 time(s) | 55000 ns (0.055 ms)
                                                                       Comparison time in total (parsing excluded):
                                                                       2462800 ns (2.463 ms)
 Keyword 'BULGARIA' found horizontally right!
 Comparison: 110 time(s) | 63900 ns (0.064 ms)
                                                                       Comparison count in total: 1067 time(s)
                                                                        Press any key to quit...
 Keyword 'SLOVENIA' found horizontally left!
 Comparison: 166 time(s) | 130000 ns (0.130 ms)
 Keyword 'CROATIA' found vertically upper!
Comparison: 150 time(s) | 150000 ns (0.150 ms)
  (eyword 'LUXEMBOURG' found vertically lower!
Comparison: 36 time(s) | 249900 ns (0.250 ms)
                                                                         Gambar 3.1.4 Matriks akhir dan informasi waktu
Gambar 3.1.3 Informasi hasil eksekusi per
                             kata
                                                                                      eksekusi & banyak perbandingan
```

3.2 Pengujian terhadap file small2.txt (ukuran 16 x 14)

```
JUCMIRAURBEFLN
                                                                       Welcome to the Puzzearch solver!
                                                                       Input your filename (without .txt): small2
Read puzzle from the file: (Size: 16 x 14)
 PANVDDPLRFTIOL
 YKNAGUSTUSPVUQ
                                                                       Read puzzie 170m che 111e. (
J U C M I R A U R B E F L N
P A N V D D P L R F T I O L
Y K N A G U S T U S P V U Q
S Y L U V J Q K Z I E J K X
A E T F A L S V Z M V S C C
 SYLUVJQKZIEJKX
 AETFALSVZMVSCC
 NMPJKREZBIBIUF
 WXLTMQIEZNUDOG
                                                                       A E I F A L S V Z M V S C C
N M P J K R E Z B I B I U F
W X L T M Q I E Z N U D O G
F H X A E X R V J U L I K A
M V R Z N M Q X L V N F O X
 F H X A E X R V J U L I K A
 MVRZNMQXLJKKTX
 KEEDMABSYXDEOK
 TIBNUJYEYVOTBD
                                                                        C E E D M A B S Y X D E O K
I B N U J Y E Y V O T B D
 MUECFIQRRNOFEY
                                                                       MUECFIQRRNOFEY
 REBMESEDMLYDRK
 PPRESDKCQEDLSI
                                                                       REBMESEDMLYDRK
                                                                         PRESDKCQEDLSI
 ZOWKLDLIRPAXBK
                                                                        Z O W K L D L I R P A X B K
A S D U D S A J K S L O E S
 ASDUDSAJKSLOES
  JANUARI
                                                                       There are 12 read keywords from the file:
 FEBRUARI
                                                                         JANUARI
 MARET
                                                                         FEBRUARI
 APRTI
                                                                         MARFT
                                                                         APRIL
 MET
                                                                         MEI
 JUNT
                                                                         JUNI
  JULI
                                                                         JULT
 AGUSTUS
                                                                         AGUSTUS
  SEPTEMBER
                                                                         SEPTEMBER
 OKTOBER
                                                                         OKTOBER
                                                                         NOVEMBER
 NOVEMBER
                                                                         DESEMBER
 DESEMBER
                                                                         ress any key to start searching!
   Gambar 3.2.1 Isian berkas small2.txt
                                                                      Gambar 3.2.2 Hasil pembacaan file masukan
       eyword 'JANUARI' found diagonally! (right lower)
omparison: 8 time(s) | 49600 ns (0.050 ms)
                                                                     UCMIRAURBEFLN
      eyword 'FEBRUARI' found horizontally left!
omparison: 21 time(s) | 281500 ns (0.282 ms)
                                                                  P A N V D D P L R F T I O L
                                                                    \mathsf{K}\ \mathsf{N}\ \mathsf{A}\ \mathsf{G}\ \mathsf{U}\ \mathsf{S}\ \mathsf{T}\ \mathsf{U}\ \mathsf{S}\ \mathsf{P}\ \mathsf{V}\ \mathsf{U}\ \mathsf{Q}
      (eyword 'MARET' found diagonally! (left lower)
Comparison: 112 time(s) | 324100 ns (0.324 ms)
                                                                    YLUVJQKZIEJKX
                                                                  A E T F A L S V Z M V S C C
      Keyword 'APRIL' found horizontally left!
Comparison: 254 time(s) | 92200 ns (0.092 ms)
                                                                  N M P J K R E Z B I B I U F
                                                                  WXLTMQIEZNUDOG
      Keyword 'MEI' found diagonally! (left upper)
Comparison: 239 time(s) | 341100 ns (0.341 ms)
                                                                    HXAEXRVJULIKA
                                                                  MVRZNMQXLJKKTX
      Keyword 'JUNI' found vertically upper!
Comparison: 166 time(s) | 317800 ns (0.318 ms)
                                                                  KEEDMABSYXDEOK
                                                                  TIBNUJYEYVOTBD
      eyword 'JULI' found horizontally right!
omparison: 136 time(s) | 319200 ns (0.319 ms)
                                                                  MUECFIQRRNOFEY
      eyword 'AGUSTUS' found horizontally right!
omparison: 46 time(s) | 47000 ns (0.047 ms)
                                                                       BMESEDMLYDRK
                                                                  P P R E S D K C Q E D L S I
      eyword 'SEPTEMBER' found diagonally! (right lower)
comparison: 56 time(s) | 53800 ns (0.054 ms)
                                                                  ZOWKLDLIRPAXBK
                                                                  ASDUDSAJKSLOES
      eyword 'OKTOBER' found vertically lower!
comparison: 106 time(s) | 495700 ns (0.496 ms)
                                                                  Comparison time in total (parsing excluded):
       eyword 'NOVEMBER' found diagonally! (left lower)
omparison: 22 time(s) | 88100 ns (0.088 ms)
                                                                  2557600 ns (2.558 ms)
                                                                  Comparison count in total: 1367 time(s)
      eyword 'DESEMBER' found horizontally left!
comparison: 201 time(s) | 147500 ns (0.148 ms)
                                                                   ress any key to quit...
Gambar 3.2.3 Informasi hasil eksekusi per
                                                                   Gambar 3.2.4 Matriks akhir dan informasi waktu
                                                                              eksekusi & banyak perbandingan
                          kata
```

3.3 Pengujian terhadap file small3.txt (ukuran 14 x 12)

```
Welcome to the Puzzearch solver!
   IVWYPSYOOMDSUVIV
                                                             Input your filename (without .txt): small3
Read puzzle from the file: (Size: 18 x 16)
   RRYPWRXTOHTDIHWG
   TJVRZOOKBRTATSBO
                                                              V W Y P S Y O O M D S U V I V
   VIRAIMGWARVTPRXA
                                                              RYPWRXTOHTDIHWG
JVRZQOKBRTATSBO
'IRAIMGWARVTPRXA
   ORVKAOVTSZAAANYK
   TVJTLLIQWDKDLVUV
   PPAIBMIZBFRSSBDG
                                                              RVKAOVTSZAAANYK
                                                              V J T L L I Q W D K D L V U V
P A I B M I Z B F R S S B D G
    \verb"URWKAKCNLYNATCAX" \\
   WOTUMRCZGDPBRRAT
                                                             URWKAKCNLYNATCAX
   G B M M F O B M Z E G F U U W N
                                                              1 O T U M R C Z G D P B R R A T
   P S M K Q A K Q H Y O B K T M G
                                                             V T P E F F R I J P I Q D F G U
                                                             PSMKQAKQHYOBKTMG
TPEFFRIJPIQDFGU
   MATDISQQSYIRALGE
                                                             MATDISQQSYIRALGE
NTSARXTTYRXITPPI
   WTSARXTTYRXITPPI
   TCBIKCZQCKAJZPJM
                                                              СВІКСХОСКАЈХРЈМ
   MFKGUZXBFXVBAWCW
                                                              F K G U Z X B F X V B A W C W
   ZKCAJELISDEGHSZS
   ATURNSEWAXFWERTS
                                                              TURNSEWAXFWERTS
                                                             There are 10 read keywords from the file:
   PRAKTTKUM
                                                              PRAKTIKUM
   STRATIMA
                                                              STRATTMA
   PROBSTAT
                                                              PROBSTAT
   ARSIKOM
                                                              ARSTKOM
   BASDAT
                                                              BASDAT
                                                              LOGKOM
   LOGKOM
                                                              MATDIS
   MATDIS
                                                              ALINGEO
   ALINGEO
                                                              ALSTRUKDAT
   ALSTRUKDAT
                                                              OTOMATA
                                                              ress any key to start searching!
   OTOMATA
   Gambar 3.3.1 Isian berkas small3.txt
                                                        Gambar 3.3.2 Hasil pembacaan file masukan
Keyword 'PRAKTIKUM' found vertically lower!
                                                          V W Y P S Y O O M D S U V I V
omparison: 34 time(s) | 132600 ns (0.133 ms)
                                                        RRYPWRXTOHTDIHWG
                                                          J V R Z Q O K B R T A T S B O
Keyword 'STRATIMA' found diagonally! (left lower)
Comparison: 23 time(s) | 293100 ns (0.293 ms)
                                                          IRAIMGWARVTPRXA
                                                        0 R V K A 0 V T S Z A A A N Y K
Keyword 'PROBSTAT' found vertically lower!
Comparison: 123 time(s) | 71100 ns (0.071 ms)
                                                          VJTLLIQWDKDLVUV
                                                          PAIBMIZBFRSSBDG
                                                        U R W K A K C N L Y N A T C A X
Keyword 'ARSIKOM' found diagonally! (left upper)
Comparison: 315 time(s) | 384800 ns (0.385 ms)
                                                          OTUMRCZGDPBRRAT
                                                        G B M M F O B M Z E G F U U W N
eyword 'BASDAT' found vertically upper
                                                          SMKQAKQHYOBKTMG
omparison: 178 time(s) | 265400 ns (0.265 ms)
                                                        V T P E F F R Ĭ J P I O D F G U
Keyword 'LOGKOM' found diagonally! (right upper)
                                                                     QQSYIRALGE
omparison: 94 time(s) | 265900 ns (0.266 ms)
                                                          TSARXTTYRXITPPI
                                                          \mathsf{C}\;\mathsf{B}\;\mathsf{I}\;\mathsf{K}\;\mathsf{C}\;\mathsf{Z}\;\mathsf{Q}\;\mathsf{C}\;\mathsf{K}\;\mathsf{A}\;\mathsf{J}\;\mathsf{Z}\;\mathsf{P}\;\mathsf{J}\;\mathsf{M}
            S' found horizontally right!
Keyword '
omparison: 253 time(s) | 602400 ns (0.602 ms)
                                                        M F K G U Z X B F X V B A W C W
                                                        ZKCAJELISDEGHSZS
Keyword 'ALINGEO' found diagonally! (right lower)
Comparison: 90 time(s) | 362400 ns (0.362 ms)
                                                          TURNSEWAXFWERTS
Keyword 'ALSTRUKDAT' found vertically lower!
Comparison: 107 time(s) | 76100 ns (0.076 ms)
                                                        Comparison time in total (parsing excluded):
                                                        2507200 ns (2.507 ms)
                                                        Comparison count in total: 1241 time(s)
Keyword 'OTOMATA' found diagonally! (left lower)
Comparison: 24 time(s) | 53400 ns (0.053 ms)
                                                         Press any key to quit...
Gambar 3.3.3 Informasi hasil eksekusi per
                                                      Gambar 3.3.4 Matriks akhir dan informasi waktu
                     kata
                                                               eksekusi & banyak perbandingan
```

3.4 Pengujian terhadap file medium1.txt (ukuran 20 x 18)

```
Relcome to the Puzzearch solver!
Input your filename (without .txt): medium1
Read puzzle from the file: (Size: 20 x 18)
IT B AB D B J Y N V R P G G D M
IT B AB D B J Y N V R P G G D M
I C N A L G E T O H O H B L N E M S
I T V G W F C T F W U T I S V S
I I G H T E I S O E M I L S T P O E
I S G Q L S W N N M Z X V S R I G L
I A R P E D O U D E P D C E E S O E
I E L S I U S R U E W R H E S I S C
I X K Z E N A P H S Z S E L S N C R
I N M Z R U A G U G Z T F S A G A U
I N U B G S R U H U H Q L S Y R O
I C Z H S T U J N M A A H J A S O S
I T P T P U A R G C M S A L S O S Q N
I G O T S Y W U H L P G L L A N H N
I R F E C U C T F Z O W T K W B Y K
I L H O I C S Z B X H W E C D Q A L
I T I M S A N W H O O V Y N H J O J
I W W J I O N W Q G C L O X F N Q V
I W W J I O N W Q G C L O X F N Q V
I W W J I O N W Q G C L O X F N Q V
I B E N L Z W Q A E F I D M Y T B S
A S E Q D H E D S O A J D U G D S A
        OTBARDRIYNVRPGGDMP
       O T B A B D B J Y N V R P G G D M P
E C N A L G E T O H O H B L N E M S
W T V G W F F C T F W V U T I S V S
M I G H T E I S O E M I L S T P O E
B S G Q L S W N N M Z X V S R I G L
        W A R P E D O U D E P D C E E S O E
C E L S I U S R U E W R H E S I S C
        T X K Z E N A P H S Z S E L S N C R
O N M Z R U A G U G Z T F S A G A U
        P N U B G S S R U H U H Q L S Y R O
F C Z H S T U J N M A A H J A S O S
        IRFECUCTFZOWTKWBYK
         YTIMSANWHOOVYNHJOJ
        H W W J I O N W Q G C L O X F N Q V
R B E N L Z W Q A E F I D M Y T B S
            MAWSDHEQUDKCDSDGA
        ASEODHEDSOAJDUGDSA
                                                                                                                                                                                                                                                                                       here are 20 read kevwords from the file:
        ASSERTING
                                                                                                                                                                                                                                                                                       ASSERTING
ASTHMA
CELSIUS
        ASTHMA
        CELSTUS
        DESPISING
                                                                                                                                                                                                                                                                                        DESPISING
         DRAUGHT
        GLANCE
         LAUGH
        LEES
        LEFTY
                                                                                                                                                                                                                                                                                        MIGHT
        MIGHT
                                                                                                                                                                                                                                                                                        NEWSFLASH
OSCAR
PASSPORT
SLIME
        NEWSEL ASH
        OSCAR
        PASSPORT
        SLIME
                                                                                                                                                                                                                                                                                        SMUG
SOURCELESS
        SMUG
         SOURCELESS
        THESAURUS
                                                                                                                                                                                                                                                                                           ess any key to start searching!
      Gambar 3.4.1 Isian berkas medium1.txt
                                                                                                                                                                                                                                           Gambar 3.4.2 Hasil pembacaan file masukan
                                  nword 'ABASH' found diagonally! (left upper)
                                                                                                                                                                                                                                                                       eyword 'SMUG' found diagonally! (left upper)
omparison: 373 time(s) | 96000 ns (0.096 ms)
                                       ord 'ASSERTING' found vertically upper!
urison: 191 time(s) | 373800 ns (0.374 ms)
                                                                                                                                                                                                                                                                     eyword 'SOURCELESS' found vertically upper!
omparison: 292 time(s) | 87500 ns (0.088 ms)
                                    word 'ASTHMA' found diagonally! (right upper)
parison: 385 time(s) | 614600 ns (0.615 ms)
                                                                                                                                                                                                                                                                    eyword 'THESAURUS' found diagonally! (right upper)
omparison: 338 time(s) | 95200 ns (0.095 ms)
                                       ord 'CELSIUS' found horizontally right!
urison: 126 time(s) | 236100 ns (0.236 ms)
                                                                                                                                                                                                                                                                                                        PED' found horizontally right!
                                        rd 'DECOMPRESS' found diagonally! (right lower) rison: 16 time(s) | 263600 ns (0.264 ms)
                                                                                                                                                                                                                                                                        mparison: 112 time(s) | 49400 ns (0.049 ms)
                                     ord 'DESPISING' found vertically lower!
arison: 28 time(s) | 341200 ns (0.341 ms)
                                                                                                                                                                                                                                                                    D T B A B D B J Y N V R P G G D M P E C N A L G E T O H O H B L N E M S N T V G W F F C T F W V U T I S V S N I G H T E I S O E M I L S T P O E B G G L S W N M Z X V S R I G L A R P P D D U D E P D C E E S O E E L S I U S R U E M R H E S I S C T X K Z E N A P H S Z S E L S N C R O N M Z R V A G U G Z T F S A G A U P N U B G S S R U H U H Q L S Y R O E C Z H S T U J N M A A H J A S O S F P T P U A G C M S A L S O S Q N O G O T S Y W U H L P G L L A N H N K F C U C T F Z O W T K W B Y K T L H O I C S Z B X H W E C D Q A L Y T I M S A N W H O O V Y N H J O J W J I M S O I S W W J I C N W Q A E F I D M Y T B S M A W S D H E Q U D K C D S D G A S S E M A S C Q D H E D S O A J D U G D S A S COMPANION TIME IN TOTAL OF S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A COMPANION TIME IN TOTAL OF S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S A S E Q D H E D S O A J D U G D S A S 
                                       ord 'DRAUGHT' found diagonally! (left lower)
prison: 117 time(s) | 849500 ns (0.850 ms)
                                       ord 'GLANCE' found horizontally left!
urison: 41 time(s) | 393800 ns (0.394 ms)
                                     ord 'LAUGH' found diagonally! (left upper
arison: 274 time(s) | 68300 ns (0.068 ms)
                                     ord 'LEFTY' found diagonally! (right upper
arison: 104 time(s) | 40100 ns (0.040 ms)
                                     ord 'MIGHT' found horizontally right!
arison: 65 time(s) | 289400 ns (0.289 ms)
                                                'NEWSFLASH' found diagonally! (right lower)
on: 104 time(s) | 80900 ns (0.081 ms)
                                       ord 'OSCAR' found vertically lower!
erison: 143 time(s) | 75300 ns (0.075 ms)
                                            'PASSPORT' found diagonally! (left lower)
ison: 161 time(s) | 96000 ns (0.096 ms)
                                                                                                                                                                                                                                                                    1401100 ns (4.401 ms)
Comparison count in total: 3506 time(s)
                                        rd 'SLIME' found horizontally left!
rison: 90 time(s) | 47600 ns (0.048 ms)
                                                                                                                                                                                                                                                                        ess any key to quit..
Gambar 3.4.3 Informasi hasil eksekusi per
                                                                                                                                                                                                                                Gambar 3.4.4 Matriks akhir dan informasi waktu
                                                                                                                                                                                                                                                                       eksekusi & banyak perbandingan
```

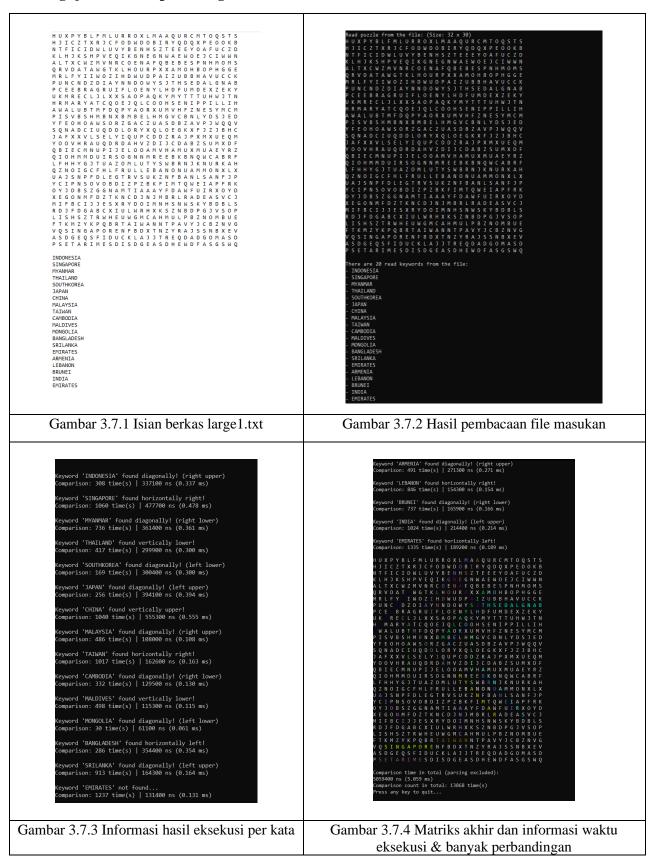
3.5 Pengujian terhadap file medium2.txt (ukuran 22 x 20)

```
$ B R E N S B E V E L I E S D F A S D F D C K F B H F N T Y I G T P O A B K Z Z B C F F D M W E R Q A O Z H P Q H G O G C Y M W O L X L E H P J C V N K Z L S G Y L E P G T O Y M W E X L S H C Y M W C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M C Y M 
                           BASH
BITTY
                                                                                                                                                                       nere are 15 read keywords from the file:
                           DUMBNESS
                          EXTRADITE
FOOL
HACKNEYED
                                                                                                                                                                       COMPLY
DUMBNESS
EMPTY
EXTRADITE
                           JEWELLERY
                          MULTIPLY
                           NOXIOUS
                           NUTRIENT
                                                                                                                                                                         ss any key to start searching!
          Gambar 3.5.1 Isian berkas medium1.txt
                                                                                                                                                    Gambar 3.5.2 Hasil pembacaan file masukan
  eyword 'ALLOTMENT' found diagonally! (left upper)
omparison: 432 time(s) | 436800 ns (0.437 ms)
                                                                                                                                                  BRENSBEVELIESDFASDF
  eyword 'BASH' found vertically upper!
omparison: 430 time(s) | 337800 ns (0.338 ms)
                                                                                                                                             DCKFBHFNTYIGTPOABKZZ
                                                                                                                                             B E O F F D M W E R Q A O Z H P Q H G O
  eyword 'BITTY' found diagonally! (right upper)
omparison: 371 time(s) | 341700 ns (0.342 ms)
                                                                                                                                             G C Y M W O L X L E H P J C V N K Z L S
                                                                                                                                             G Y L E P G T D Y L U X L U S O Q R K G
  eyword 'COMPLY' found diagonally! (left lower)
omparison: 393 time(s) | 369500 ns (0.370 ms)
                                                                                                                                             DGUQNRDLZLBFLGPPIJGI
                                                                                                                                             V U E S A K P L A E A V H U M M U L S A
   eyword 'DUMBNESS' found diagonally! (right lower)
umparison: 140 time(s) | 237800 ns (0.238 ms)
                                                                                                                                                K M D A I C R A W B A H V L G G T I B
                                                                                                                                                  NIBTXIAKEEHTYMVUYVY
 eyword 'EMPTY' found vertically lower!
omparison: 332 time(s) | 287300 ns (0.287 ms)
                                                                                                                                                  T E L N T K X H J S E K B N N C O M P
                                                                                                                                                  YUMYEXKEPEDOMBDQHPW
  eyword 'EXTRADITE' found diagonally! (left lower)
omparison: 86 time(s) | 59600 ns (0.060 ms)
                                                                                                                                             S M D T T W S L M X F D T F I D K J O H
 eyword 'FOOL' found horizontally left!
omparison: 523 time(s) | 398800 ns (0.399 ms)
                                                                                                                                             I D T H S O X S P D J F C G Q O G Y L S
                                                                                                                                             QIHXMTLLTHNZNLFUOHIE
 eyword 'HACKNEYED' found diagonally! (left upper)
omparison: 265 time(s) | 123500 ns (0.124 ms)
                                                                                                                                             B G S U J L Z L Y I J U N O X I O U S L
                                                                                                                                             D N A E T B J A A X E Y T E Q K P Y H Q
  eyword 'JEWELLERY' found vertically upper!
omparison: 223 time(s) | 67300 ns (0.067 ms)
                                                                                                                                             S J B Z I C O U M O N X A R R M K D E R
                                                                                                                                             X F U K O M H G N G K E J I I F I Z R B
 eyword 'MULTIPLY' found diagonally! (right upper)
omparison: 311 time(s) | 80600 ns (0.081 ms)
                                                                                                                                             SIFMFMFYMAOWHKAELUWK
                                                                                                                                             K K P L O O F B Z J X D X A W V N R W H
S L N X H N U N Y W T J I U W Z J T P N
  eyword 'NOXIOUS' found horizontally right!
omparison: 382 time(s) | 305200 ns (0.305 ms)
 eyword 'NUTRIENT' found diagonally! (right lower)
omparison: 344 time(s) | 85600 ns (0.086 ms)
                                                                                                                                                  SEHDSXAWQGEYMFDSAPM
 eyword 'POLISHER' found vertically lower!
omparison: 312 time(s) | 108900 ns (0.109 ms)
                                                                                                                                              Comparison time in total (parsing excluded):
                                                                                                                                             3318300 ns (3.318 ms)
   yword 'POPULARITY' found diagonally! (left lower)
mparison: 44 time(s) | 77900 ns (0.078 ms)
                                                                                                                                              Comparison count in total: 4588 time(s)
                                                                                                                                              Press any key to quit...
Gambar 3.5.3 Informasi hasil eksekusi per kata
                                                                                                                                              Gambar 3.5.4 Matriks akhir dan informasi waktu
                                                                                                                                                                   eksekusi & banyak perbandingan
```

3.6 Pengujian terhadap file medium3.txt (ukuran 24 x 22)

```
Relcome to the Puzzearch solver!
Input your filename (without .txt): medium3
Read puzzle from the file: (Size: 24 x 22)
REEPSDFADDKIECDSAGMUID
ROMFAMHUOVMLFGIBTTDUYE
OTTXSVJPREZKYTTZCIOEF
RZYCSVEQEAGOTQGXJASUY
PWAPBHKCKTGSRRCQEBHDU
RICLXSZSMCAGCMTBTHOJPS
RCKPCHBNIPBGZYHDCLMOC
RXSKHMIKQLGOPWNAVOIOOD
RNGPEMEXEFUQPDBVHPCOLD
RIGNESHMIKQLGOPWNAVOIOOD
RNGPEMEXEFUQPDBVHPCOLD
RKRVCGHSECGQDHHXDOYYMC
RVYVSIYFEZZZYJMKHJEKXSS
RDXZOLUFGZLOHMVOCAHYI
RZCOHANZELOLICHEETBQAG
RPZSPPGPBLGEXEXOIVQYE
RWXTXYFZAXBRGRPLNOPTIH
RYIQYPRCHPECEGTTXNJIKC
RVYCGHSECGGTAWNIGSAGVPP
RWEKHCRAESERLZNPCPLF
           P E E P S D F A D D K I E C D S A G M U I D G Q M F A M H U O V M L F G I B T T D U Y E Y O T T X S V J P R E Z K Y T T Z C I O E F U R Z Y C S V E Q E A G O T Q G X J A S U Y
            P W A P B H H K C K T G S R R C Q E B H D U
C I C L X S Z S M C A G C M T B T H O J P S
            X R C K P C H B N I P B G Z Y H D C L M O C
J K S K H M I K Q L G O P W N A V O I O O D
            B N G P E M E X E F U Q P D B V H P C O L J
R I E N R R L X K G D K M O F D S R N R B L
            BKRVCGHSECGODHHXDOYYMC
            O N P D M X M P G A T O A S K Y D T P Z H G
            R W Y V S I Y E Z Z Z Y I M K H J E K X S S
N D O X Z O L U F G Z L O H M V O C A H Y I
            BZCOHANZELOLICHEETBOAG
            W R P Z S P P G P B L G E X E X O I V Q Y E
O W X T X Y F Z A X B R G R P L N O P T I H
J Y I Q Y P R C H P E C E G T T X N J I K C
            MCVDIHXLJJTAWAKINGXQTP
           R M E K H C R A E S E R L Z N P C P L P K U
E C N E U Q O L E V D U B I W P Q T S F H P
B F B I U K X M A N E V C O L H P V D O F T
D H J C Q R P E S I I R I Q T A J E A W E Y
            CKYASLOBYRATSEDAEQETTT
            ABOLISH
                                                                                                                               here are 13 read keywords from the file:
ABOLISH
AWAKING
BIRDSONG
DIABOLIC
            AWAKING
            RTRDSONG
            DIABOLIC
            FLASTIC
            ELOQUENCE
                                                                                                                               ELASTIC
            EXEMPLARY
FLICKER
            LICHEE
                                                                                                                                PICKER
                                                                                                                               PROTECTION
RESEARCH
REVELRY
            PROTECTION
            REVELRY
                                                                                                                                 ss any key to start searching!
       Gambar 3.6.1 Isian berkas medium3.txt
                                                                                                                Gambar 3.6.2 Hasil pembacaan file masukan
                                                                                                                      EEPSDFADDKIECDSAGMUID
            eyword 'ABOLISH' found diagonally! (right upper)
omparison: 447 time(s) | 105200 ns (0.105 ms)
                                                                                                                   G Q M F A M H U O V M L F G I B T T D U Y E
Y O T T X S V J P R E Z K Y T T Z C I O E F
            eyword 'AWAKING' found horizontally right!
omparison: 489 time(s) | 362300 ns (0.362 ms)
                                                                                                                       PBHHKCKTGSRRCQEBHDU
            eyword 'BIRDSONG' found diagonally! (right lower)
omparison: 209 time(s) | 455900 ns (0.456 ms)
                                                                                                                         CLXSZSMCAGCMTBTHOJPS
                                                                                                                   X R C K P C H B N I P B G Z Y H D C L M O C
J K S K H M I K Q L G O P W N A V O I O O D
           Keyword 'DIABOLIC' found vertically lower!
Comparison: 73 time(s) | 270300 ns (0.270 ms)
                                                                                                                   B N G P E M E X E F U Q P D B V H P C O L J
R I E N R R L X K G D K M O F D S R N R B L
           (eyword 'ELASTIC' found diagonally! (left lower)
Comparison: 351 time(s) | 329200 ns (0.329 ms)
                                                                                                                   B K R V C G H S E C G Q D H H X D O Y Y M C
                                                                                                                   0 N P D M X M P G A T 0 A S K Y D T P Z H G
            eyword 'ELOQUENCE' found horizontally left!
omparison: 603 time(s) | 428500 ns (0.429 ms)
                                                                                                                   R W Y V S I Y E Z Z Z Y I M K H J <mark>E</mark> K X S S
                                                                                                                   N D O X Z O L U F G Z L O H M V O C A H Y
            eyword 'EXEMPLARY' found diagonally! (left upper)
                                                                                                                   B Z C O H A N Z E L O L I C H E E T B Q A G
                                                                                                                   W R P Z S P P G P B L G E X E X O I V Q Y E
           (eyword 'FLICKER' found vertically upper!
Comparison: 215 time(s) | 268900 ns (0.269 ms)
                                                                                                                   0 W X T X Y F Z A X B R G R P L N <mark>0</mark> P T I H
                                                                                                                   J Y I Q Y P R C H P E C E G T T X N J I K C
                                                                                                                   1 C V D I H X L J J T A W A K I N G X Q T P
           Keyword 'LICHEE' found horizontally right!
Comparison: 401 time(s) | 81100 ns (0.081 ms)
            eyword 'PICKER' found diagonally! (right lower)
omparison: 106 time(s) | 50600 ns (0.051 ms)
                                                                                                                   B F B I U K X M A N E V C O L H P V D O F T
                                                                                                                   eyword 'PROTECTION' found vertically lower!
omparison: 246 time(s) | 77000 ns (0.077 ms)
                                                                                                                   Comparison time in total (parsing excluded):
            eyword 'RESEARCH' found horizontally left!
omparison: 534 time(s) | 110700 ns (0.111 ms)
                                                                                                                   2978800 ns (2.979 ms)
                                                                                                                     Comparison count in total: 4603 time(s)
            eyword 'REVELRY' found diagonally! (left upper)
omparison: 621 time(s) | 135400 ns (0.135 ms)
                                                                                                                     ress any key to quit...
Gambar 3.6.3 Informasi hasil eksekusi per kata
                                                                                                            Gambar 3.6.4 Matriks akhir dan informasi waktu
                                                                                                                            eksekusi & banyak perbandingan
```

3.7 Pengujian terhadap file large1.txt (ukuran 32 x 30)



3.8 Pengujian terhadap file large2.txt (ukuran 34 x 32)

```
ADHERENCE
AMUSE
BIBLICAL
BRAID
BRINY
DISHONEST
FINAL
INERTNESS
INSCRIBED
IRREGULAR
JUNE
      JUNE
PERJURY
PRESCRIBED
      RECOVER
SACKING
SHOWER
SOLID
SPATULA
            Gambar 3.8.1 Isian berkas large2.txt
                                                                                                                           Gambar 3.8.2 Hasil pembacaan file masukan
              ord 'ADHERENCE' found vertically lower!
arison: 952 time(s) | 196100 ns (0.196 ms)
               rd 'AMUSE' found diagonally! (left lower)
rison: 553 time(s) | 409000 ns (0.409 ms)
                                                                                                                                            URUGUAY' found diagonally! (left upper)
n: 868 time(s) | 113700 ns (0.114 ms)
                   'INERTNESS' found diagonally! (right lo
on: 337 time(s) | 246400 ns (0.246 ms)
                  'SACKING' found horizontally right!
son: 1045 time(s) | 260600 ns (0.261 ms)
Gambar 3.8.3 Informasi hasil eksekusi per kata
                                                                                                                      Gambar 3.8.4 Matriks akhir dan informasi waktu
                                                                                                                                       eksekusi & banyak perbandingan
```

3.9 Pengujian terhadap file large3.txt (ukuran 36×34)

N S Z N A R U C A X W M F M Y R M C N F Z C P A Y P D P R I A J A Y R I K A U A K N F U K F Y E Z Q K Z S A M T E D N K T M P Y G Q L A S D K L M T J I O V Q C S B M P K I P C A L L I D A C Z I H J S C Z U N L E Y R C Y B A V S D G A T O Y O T N A Q S E Y N R I V X N A G J A M F E M A X J D E X T N W W X I D E B E R T O N I D C X E H B U H T U O M Y L P G N P O Q K F S S H O R Z J O T K I B C B R L Z L X C R V X Z B Q L N P H N K C O G L A S X H E Y N G X M A A T V B U W M I Z U W G P E I D H R W M M T S I P L G P E I D X O L B X F A F D M V V T U K H X I L V Y D I S P B O N N E R A M O Q C H E K V R A O X N T C Q Z O Z W A W R R L Q R T T I E O C I X E M S Z G J J U K Q B H O J X G M I R G T Z A V K F F N L G V N Z L T A B T V A S R E N A U L T D T O Q E M M ET N N V T D U Y J D I I O Q N L I N T N G M Y K I P L J P T M L H B D V I L S H B Y W V C H M T M Q D I V S W N U Z X H W Y S N C A A W I T P U S I Q A O F A I D A O E N A P F B Z O L K Y H E Y X H P A V G N W N O L L C L S S U H Y R H O B E L H W L A A G Q F P D D A D D F W U F L P V M G I L R F S E B N Q E L P S Y E H R G K T P A G A N I P O S D I K D R Q E S O A T O I F E O T Q X C J T L Y C F W R B E P A S T O N M A R T I N L W T R R N W L J O I J X B W E B C I N A I Z J X T D Q L Y A Z E E A Q A R U O A Q M K P X B R A W U H G Y M K H A N A R O S C Y T Y I N G S E T M L O K J Y L O S E Z Y U P B I M L Q G H I F N F B W T E H A I N S L E T P E M D P L B V E N X E H O E P E Y C I O O I I T R C C N L H B J B U X A A D D C E R F T Z R E R J G K P R R U V I K O E N I G S E G G R C M S B G D B G R O F R D Y V I L N A A H S P E U G G O T T U V P U I A J W P P V E E U C D B O X H S D T H N O R A D I I R K A G V L Y S X Q A R R C A H I U X K G E W H N W E L P E Z S O B V F P I Y K C N H Y K J R D L G H B Z S C F H D S A W N	ACURA ALPINE APOLLO PENHALL ARIEL PEUGEOT ASTONMARTIN AUSTINHEALEY BENTLEY BENTLEY BUGATTI CADILLAC CATERHAM CHEVROLET DATSUN DEBERTI EXOMOTIVE FERRARI FORMULADRIFT FORSBERGRACING HENNESSEY HOONIGAN INFINITI KOENIGSEGG LAMBORGHINI RANGEROVER MASERATI MERCEDESBENZ MILLYS MILLYS MILLYS MILLYS MASCAN MISSAN PAGANI MEXICO MEXICO MEXICO MEXICO MEXICO PENHALL PELL AND PELL A	
Gambar 3.9.1 Isian berkas large3.txt (Puzzle)	Gambar 3.9.2 Isian berkas large3.txt (Kata kunci)	
Welcome to the Puzzearch solver! Input your filename (without .txt): large3 Read puzzle from the file: (Size: 34 x 32) NSZNARUCAXWMFMYRMCNFZCPAYPDPRIAJ AYRIKAUAKNFUKFYEZQKZSAMTEDNKTMPY GQLASDKLMTJIOVQCSBMPKIPCALLIDACZ IHJSCZUNLEYRCYBAVSDGATOYOTNAQSEY NRIVXNAGJAMFEMAXJDEXTNWWXIDEBERT ONIDCXEHBUHTUOMYLPGNPOQKFSSHORZJ OTKIBCBRLZLXCRVXZBQLNPHNKCOGLASX HEYNGXMAATVBUWMIZUWGPEIDHRWMMTSI PLGPEIDXOLBXFAFDMVVTUKHXILVYDISP BONNERAMOQCHEKVRAOXNTCQZOZWAWRRL QRTTIEOCIXEMSZGJJUKQBHOJXGMIRGTZ AVKFFNLGVNZLTABTVASRENAULTDTOQEM METNNVTDUVJDIOQNLINTNGMYKIPLJPTM LHBDVILSHBYWVCHMTMQDIVSWNUZXHWYS NCAAWITPUSIQAOFAIDAOENAPFBZOLKYH EYXHPAVGNWNOLLCLSSUHYRHOBELHWLAA GQFPDDADDFWUFLPVMGILRFSEBNQELPSY EHRGKTPAGANIPOSDIKDRQESOATOIFEOT QXCJTLYCFWRBEPASTONMARTINLWTRNW LJOIJXBWEBCINAIZJXTDQLYAZEEAQARU OAQMKPXBRAWUHGYMKHANAROSCYTYINGS ETMLOKJLRYLUAJYLDESEZYUPBIMLQGHI FNFBWTEHAINSLETPEMDPLBVENXEHOEPE YCIOOIITRCCNLHBJBUXAADDCERFTZRER WJJALZGEEVOGJTPJRKUGNRBTAVLYSVPA YVILNAAHSPEUGEOTTUVPUIAJWPPVEEUC DBOXHSDTIHNORADIIRKAGVLYSXQARRCA HIUXKGEWHNWELPEZSOBVFPIYKCNHYKJR DLGHBZDAXOIZNEBSEDECREMYLUMAXBWS MKVSQUGLTQNHGNICARGREBSROFYDSICE MITSUBISHISFQEHUWRPDVXUPVTJJRSPD RIPASDETERAUTLINTSIDNEOASDHDSKIA FIASNIHSSKTHEFGHTASDFHEQSFHDSAWN	- ACURA - ALPINE - APOLLO - ARIEL - ASTONMARTIN - AUSTINHEALEY - BENTLEY - BUGATTI - CADILLAC - CATERHAM - CHEVROLET - DATSUN - DEBERTI - EXOMOTIVE - FERRARI - FORSBERGRACING - HENNESSEY - HOONIGAN - INFINITI - KOENIGSEGG - LAMBORGHINI - RANGEROVER - MASERATI - MERCEDESBENZ - MITSUBISHI - NISSAN - PAGANI - GRELIANT - PONTIAC - RELIANT - RENAULT - RJANDERSON - SIERRACARSI - TOYOTA - VOUKSWAGEN - VOUKSWAGEN - WILLYS - GYMKHANA - FORZATHON - FESTIVAL - MCLARENCARS - HORIZON - MITSUBISHI - NISSAN - PAGANI - ARCADE Gambar 3.9.4 Hasil pembacaan file masukan (Kata kunci)	

```
Geyword 'HENNESSEY' found diagonally! (left upper)
Comparison: 351 time(s) | 88400 ns (0.088 ms)
        eyword 'ACURA' found horizontally left!
comparison: 18 time(s) | 42700 ns (0.043 ms)
                                                                                                                                                                                                          (eyword 'HOONIGAN' found vertically upper!
Comparison: 279 time(s) | 67000 ns (0.067 ms)
     Keyword 'ALPINE' found diagonally! (left upper)
Comparison: 1321 time(s) | 462600 ns (0.463 ms)
                                                                                                                                                                                                        Keyword 'INFINITI' found diagonally! (right upper)
Comparison: 348 time(s) | 89900 ns (0.090 ms)
     Keyword 'APOLLO' found vertically upper!
Comparison: 971 time(s) | 387900 ns (0.388 ms)
     Keyword 'ARIEL' found diagonally! (right upper)
Comparison: 1264 time(s) | 356900 ns (0.357 ms)
                                                                                                                                                                                                        Keyword 'KOENIGSEGG' found horizontally right!
Comparison: 974 time(s) | 158100 ns (0.158 ms)
                                                                                                                                                                                                        Keyword 'LAMBORGHINI' found diagonally! (right lower)
Comparison: 889 time(s) | 128800 ns (0.129 ms)
     Keyword 'ASTONMARTIN' found horizontally right!
Comparison: 930 time(s) | 457100 ns (0.457 ms)
     Keyword 'AUSTINHEALEY' found diagonally! (right lower)
Comparison: 485 time(s) | 309900 ns (0.310 ms)
                                                                                                                                                                                                          Geyword 'RANGEROVER' found vertically lower!
Comparison: 824 time(s) | 100600 ns (0.101 ms)
                                                                                                                                                                                                        Keyword 'MASERATI' found vertically lower!
Comparison: 96 time(s) | 63800 ns (0.064 ms)
     Keyword 'BENTLEY' found vertically lower!
Comparison: 597 time(s) | 287300 ns (0.287 ms)
                                                                                                                                                                                                          (eyword 'MERCEDESBENZ' found horizontally left!
Comparison: 1218 time(s) | 233800 ns (0.234 ms)
     Keyword 'BUGATTI' found diagonally! (left lower)
Comparison: 537 time(s) | 281600 ns (0.282 ms)
     Keyword 'CADILLAC' found horizontally left!
Comparison: 138 time(s) | 55400 ns (0.055 ms)
                                                                                                                                                                                                          (eyword 'MCLARENCARS' found diagonally! (left upper)
Tomparison: 474 time(s) | 131800 ns (0.132 ms)
     Keyword 'CATERHAM' found diagonally! (left upper)
Comparison: 852 time(s) | 109500 ns (0.110 ms)
                                                                                                                                                                                                          (eyword 'MITSUBISHI' found horizontally right!
Comparison: 1287 time(s) | 162500 ns (0.163 ms)
     Keyword 'CHEVROLET' found vertically upper!
Comparison: 589 time(s) | 85300 ns (0.085 ms)
                                                                                                                                                                                                        Keyword 'NISSAN' found diagonally! (left upper)
Comparison: 1560 time(s) | 172700 ns (0.173 ms)
     Keyword 'DATSUN' found diagonally! (right upper)
Comparison: 681 time(s) | 111600 ns (0.112 ms)
                                                                                                                                                                                                        Keyword 'PAGANI' found horizontally right!
Comparison: 725 time(s) | 105400 ns (0.105 ms)
     Keyword 'DEBERTI' found vertically lower!
Comparison: 903 time(s) | 132100 ns (0.132 ms)
                                                                                                                                                                                                        Keyword 'PEEL' found diagonally! (right lower)
Comparison: 347 time(s) | 113300 ns (0.113 ms)
                                                                                                                                                                                                          (eyword 'PENHALL' found vertically lower!
Comparison: 738 time(s) | 157000 ns (0.157 ms)
     Keyword 'EXOMOTIVE' found diagonally! (right lower)
Comparison: 748 time(s) | 146600 ns (0.147 ms)
                                                                                                                                                                                                          Geyword 'PEUGEOT' found horizontally right!
Comparison: 1115 time(s) | 170000 ns (0.170 ms)
     Keyword 'FERRARI' found vertically lower!
Comparison: 731 time(s) | 181600 ns (0.182 ms)
     Keyword 'FORMULADRIFT' found diagonally! (left lower)
Comparison: 76 time(s) | 58700 ns (0.059 ms)
                                                                                                                                                                                                          (eyword 'PLYMOUTH' found horizontally left!
Comparison: 224 time(s) | 85200 ns (0.085 ms)
       Keyword 'FORSBERGRACING' found horizontally left!
Comparison: 1184 time(s) | 145400 ns (0.145 ms)
                                                                                                                                                                                                           eyword 'POLARIS' found diagonally! (left upper)
omparison: 909 time(s) | 132300 ns (0.132 ms)
Gambar 3.9.5 Informasi hasil eksekusi per kata
                                                                                                                                                                                                        Gambar 3.9.6 Informasi hasil eksekusi per kata (2)
                                                                                                                                                                                                                                 S Z N A R U C A X W M F M Y R M C N F Z C P A Y P D P R I A J
Y R I K A U A K N F U K F Y E Z Q K Z S A M T E D N K T M P Y
Q L A S D K L M T J I D V Q C S B M P K I P C A L L I D A C Z
U A S D K L M T J I D V Q C S B M P K I P C A L L I D A C Z
H J S C Z U N L E Y R C Y B A V S D G A T D Y O T N A Q S E Y
R I Z N A A G J A M F E M A X J D E X T N M W X I D E B E R Y
N I D C X E H B U H T U O M Y L P G N P O Q K F S S H O R Z J
T K I B C B R L Z L X C X V X Z B Q L N P H N K C O G L A S X
E Y N G X M A A T V B U M M I Z U M G P E I D H R W M M T S I
L G P E I D X O L B X F A F D M V V T U K H X I L V Y D I S P
O N N E R A M O Q C H E K V R A O X N T C Q Z O Z W A W R R
R T T I E O C I X E M S Z G J J U K Q B H O J X G M I R G T Z
V K F F N L G V N Z L T A B T V A S R E N A U L T D Y O E
E T N N V T D U V J D I O Q N L I N T N G M Y K I P L J P T M
H B D V I L S H S Y W C Y M T Y Q D I V S W N Z X H W Y S
C A A W I T P U S I Q A O F A I D A O E N A P F B Z O L K Y H
Y X H P A V G N W N O L C L L S S U H Y R H O B E L H W L A A
Q F P D D A D D F W U F L P V M G I L R F S E B N Q E L P S Y
X C J T L Y C F W R B E P A S T O N M A R T I N L W T R R N W
A Q M K P X B R A W U H G Y M K H A M A R O S G Y T Y I M G S
T M L O K J R Y L U A J Y L D E S E Z Y D P B I M Q G H P
S G K P R R U V I K O E M I S S E G S C M S B G D B G N O F R
S J L A L Z G E E V O G J T P J R K U G N R B T A V L Y S V P A
U I L N A A H S P E U G E O T T U V P U I T A J W P P V E E U C
B O X H S D T I H N O R A D I I R K A G V L Y S X Q A R C A
S G Y P R U V I K O E M I S S E G C C R E M Y L U M A X B N S
V I L N A A H S P E U G E O T T U V P U I T A J W P P V E E U C
B O X H S D T I H N O R A D I I R K A G V L Y S X Q A R C A
S U S U B I S H I S F Q E H U W R P D V X U P V T J R S P O
I I P A S D E T E R A V L I Y S Y P A

U I L N A S B T S H I S F Q E H U W R P D V X U P V T J S P D
I T S U B I S H I S F Q E H U W R P D V X U P V T J S P D
I T S U B I S H I S F Q E H U W R P D V X U P V T J S P D
I T S U B I S H I S F Q E H U W R P D V X U P V
                                        yword 'PONTIAC' found vertically upper!
mparison: 283 time(s) | 76500 ns (0.077 ms)
                                         word 'RELIANT' found diagonally! (right upper)
parison: 1029 time(s) | 175100 ns (0.175 ms)
                                        yword 'RENAULT' found horizontally right!
mparison: 522 time(s) | 71500 ns (0.072 ms)
                                         word 'RJANDERSON' found diagonally! (right lower)
parison: 408 time(s) | 136900 ns (0.137 ms)
                                        yword 'SIERRACARSE' found vertically lower!
mparison: 907 time(s) | 115800 ns (0.116 ms)
                                        word 'SUBARU' found diagonally! (left lower)
                                        yword 'TOYOTA' found horizontally left!
mparison: 163 time(s) | 65100 ns (0.065 ms)
                                        yword 'VAUXHALL' found diagonally! (left upper)
mparison: 384 time(s) | 130400 ns (0.130 ms)
                                        yword 'VOLKSWAGEN' found vertically upper!
mparison: 1290 time(s) | 115400 ns (0.115 ms)
                                        yword 'WILLYS' found diagonally! (right upper)
mparison: 747 time(s) | 92100 ns (0.092 ms)
                                          word 'GYMKHANA' found horizontally right!
parison: 807 time(s) | 160200 ns (0.160 ms)
                                         word 'FORZATHON' found diagonally! (right lower)
parison: 867 time(s) | 132200 ns (0.132 ms)
                                          ord 'FESTIVAL' found vertically lower!
varison: 321 time(s) | 53300 ns (0.053 ms)
                                            ord 'HORIZON' found diagonally! (left lower)
orison: 219 time(s) | 55900 ns (0.056 ms)
                                              d 'MEXICO' found horizontally left!
rison: 460 time(s) | 92100 ns (0.092 ms)
                                                                                                                                                                                                                               omparison time in total (parsing excluded):
518200 ns (7.518 ms)
omparison count in total: 35017 time(s)
ress any key to quit...
                                         word 'ARCADE' found diagonally! (left upper)
parison: 1355 time(s) | 145000 ns (0.145 ms)
Gambar 3.9.7 Informasi hasil eksekusi per kata
                                                                                                                                                                                                           Gambar 3.9.8 Matriks akhir dan informasi waktu
                                                                                                                                                                                                                                          eksekusi & banyak perbandingan
```

Poin	Ya	Tidak
1. Program berhasil dikompilasi tanpa	V	
kesalahan (no syntax error)		
2. Program berhasil running	V	
3. Program dapat membaca file masukan	$\sqrt{}$	
dan menuliskan luaran		
4. Program berhasil menemukan semua	$\sqrt{}$	
kata di dalam puzzle		