LAPORAN TUGAS KECIL 1

PENYELESAIAN *WORD SEARCH PUZZLE* ALGORITMA *BRUTE FORCE*

Mata Kuliah IF2211 Strategi Algoritma

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SEKOLAH TEKNIK ELEKTRO DAN INFORMATIKA

INSTITUT TEKNOLOGI BANDUNG

2021/2022

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BAB I
ALGORITMA

A. Algoritma Brute Force

Algoritma *brute force* adalah pendekatan yang lempang (straightforward) untuk memecahkan suatu persoalan. Biasanya algoritma ini didasarkan pada dua hal, yaitu pernyataan persoalan (*problem statement*) dan definisi/konsep yang terlibat dalam persoalan tersebut. Algoritma ini dicirikan dengan penyelesaian persoalan yang bersifat sangat sederhana, langsung, dan jelas (*obvious*). Penyelesaian dengan cara ini bergantung pada kekuatan komputasi mesin semata.

B. Spesifikasi Tugas

Word search puzzle adalah permainan kata dimana pemain harus menemukan beberapa kata tersembunyi dalam kumpulan huruf acak. Kumpulan huruf tersebut biasa diletakkan pada "papan" berbentuk segi empat atau dapat disebut juga matriks huruf. Kata-kata pada matriks huruf ini dapat ditemukan dalam delapan arah yang mungkin, yaitu, vertikal ke atas, vertikal ke bawah, horizontal ke kanan, horizontal ke kiri, diagonal ke kanan atas, diagonal ke kanan bawah, diagonal ke kiri atas, dan diagonal ke kiri bawah. Tugas yang harus diselesaikan adalah merancang algoritma brute force untuk menemukan semua kata di dalam *word search puzzle*.

Gambar 1. *Word Search Puzzle*

C. Langkah-Langkah yang Digunakan

Penulis mengimplementasikan algoritma *brute force* tanpa pendekatan heuristic. Pencarian kata dilakukan satu per satu dengan langkah-langkah sebagai berikut untuk setiap kata yang dicari:

1. Periksa setiap huruf pada matriks *puzzle* secara berurut hingga ditemukan huruf yang sama dengan huruf pertama pada kata yang dicari.
2. Periksa huruf di sebelah kanan huruf tersebut. Jika sama dengan huruf kedua pada kata yang dicari, periksa huruf di sebelah kanannya lagi. Begitu seterusnya hingga huruf ke-N pada kata yang dicari atau telah mencapai ujung matriks. Jika seluruhnya sama, maka kata telah ditemukan.
3. Jika kata belum ditemukan, periksa dengan cara yang mirip dengan langkah 2 namun ke arah lainnya yaitu horizontal ke kiri, vertikal ke bawah, vertikal ke atas, diagonal ke kanan bawah, diagonal ke kanan atas, diagonal ke kiri bawah, dan diagonal ke kiri atas. Lakukan hingga kata ditemukan.
4. Jika kata belum ditemukan, ulangi langkah 1 – 3 hingga kata ditemukan atau tidak ada lagi huruf yang sama dengan huruf pertama pada kata yang dicari.

BAB II
SOURCE PROGRAM

A. Struktur Kode

Program ditulis dalam bahasa C++ standar 2014. Source terbagi menjadi tiga file yaitu “main.cpp”, “puzzle.hpp”, dan “puzzle.cpp” yang disimpan dalam satu direktori.

B. main.cpp

File ini berisi alur utama program.

```
#include <iostream>
#include <fstream>
#include <string>
#include <exception>
#include <stdexcept>
#include <chrono>
#include <vector>

#include "puzzle.hpp"

void help()
{
  std::cout << "Usage: wordpuzzle [filename]\n"
            << "If file is not provided, reads stdin.\n";
}

int main(int argc, char *argv[])
{
  std::ifstream fin;

  try
  {
    // 1: Process argument

    if (argc == 2)
    {
      if (argv[1] == std::string("-h") || argv[1] == std::string("--
help"))
      {
        help();
        return 0;
      }
      else
      {
        fin.open(argv[1]);
```

```
        if (fin.fail())
        {
          throw std::runtime_error(std::string("Failed to open file."));
        }
      }
    }

    // 2: Read input

    std::istream *in = &std::cin;

    if (fin.is_open())
    {
      in = &fin;
    }

    WordPuzzle puzzle(*in);

    std::vector<std::string> words;
    for (std::string word; std::getline(*in, word);)
    {
      if (!word.empty())
      {
        words.push_back(word);
      }
    }

    // 3: Find puzzle solution

    std::vector<WordPuzzleSolution> solutions;

    auto t1 = std::chrono::high_resolution_clock::now();

    for (const std::string &word : words)
    {
      solutions.push_back(puzzle.findWord(word));
    }

    auto t2 = std::chrono::high_resolution_clock::now();
    auto duration = t2 - t1;

    // 4: Print output

    puzzle.print();

    long long comps = 0;
    long long found = 0;
    for (const WordPuzzleSolution &solution : solutions)
```

```
    {
      comps += solution.compCount;
      solution.print();

      if (solution.type != SolutionType::None)
      {
        found++;
      }
    }

    if (fin.is_open())
    {
      fin.close();
    }

    std::cout << "Total words       : " << words.size()
              << " (found: " << found
              << ", not found: " << words.size() - found << ")\n"
              << "Total comparisons : " << comps << "\n"
              << "Total time taken  : "
              << std::chrono::duration_cast<
                            std::chrono::nanoseconds>(duration)
                            .count()
              << " nanoseconds\n";
  }
  catch (std::exception &e)
  {
    std::cout << "Error: " << e.what() << std::endl;
  }
  catch (...)
  {
    std::cout << "An unknown error occured.\n";
  }

  return 0;
}
```

C. puzzle.hpp

File ini berisi deklarasi objek *puzzle* dan *solution*-nya.

```
#ifndef PUZZLE_H_INCLUDED
#define PUZZLE_H_INCLUDED

#define PUZZLE_MAX_SIZE 999

class WordPuzzleSolution;

class WordPuzzle
```

```
{
public:
  int colsize, rowsize;
  char table[PUZZLE_MAX_SIZE][PUZZLE_MAX_SIZE];
  WordPuzzle(std::istream &in);
  WordPuzzleSolution findWord(std::string word) const;
  void print() const;
};

enum class SolutionType
{
  Left,
  Right,
  Top,
  Bottom,
  TopLeft,
  TopRight,
  BottomLeft,
  BottomRight,
  None
};

class WordPuzzleSolution
{
  const WordPuzzle &puzzle;
  std::string word;

public:
  SolutionType type = SolutionType::None;
  int i, j;
  long long compCount = 0;

  WordPuzzleSolution(const WordPuzzle &p, std::string w)
      : puzzle(p)
  {
    this->word = w;
  }

  void set(SolutionType t, int i, int j)
  {
    this->type = t;
    this->i = i;
    this->j = j;
  }

  void print() const;
};
```

```
#endif
```

D. puzzle.cpp

File ini berisi definisi metode-metode pada objek *puzzle* dan *solution* yang digunakan pada program utama. Di sini juga terdapat implementasi dari algoritma *brute force* pencarian kata yang telah dijabarkan pada bagian sebelumnya, yaitu pada metode "WordPuzzle::findWord".

```
#include <iostream>
#include <cctype>
#include <stdexcept>

#include "puzzle.hpp"

static int countDigit(long long n)
{
  int count = 0;
  while (n != 0)
  {
    n = n / 10;
    ++count;
  }
  return count;
}

WordPuzzle::WordPuzzle(std::istream &in)
{
  char c;

  int colsize = -1;

  int i = 0;
  int j = 0;

  bool isEmptyLine = false;

  while (!isEmptyLine &&
         in >> std::noskipws >> c)
  {
    if (c == '\n')
    {
      if (j == 0)
      {
        isEmptyLine = true;
      }
      else
```

```
      {
        if (colsize < 0)
        {
          colsize = j;
        }
        else if (j != colsize)
        {
          throw std::runtime_error("Invalid input.");
        }

        j = 0;
        i++;
      }
    }
    else if (!std::isblank(c))
    {
      this->table[i][j] = c;
      j++;
    }
  }

  this->colsize = colsize;
  this->rowsize = i;
}

void WordPuzzle::print() const
{
  int titleLen = 10 + countDigit(this->rowsize) + countDigit(this-
>colsize);
  int colLen = (this->colsize * 3) - 1;
  if (colLen > titleLen)
  {
    std::cout << std::string((colLen - titleLen) / 2, ' ');
  }

  std::cout << " " << this->rowsize << " x " << this->colsize << "
PUZZLE\n";

  for (int i = 0; i < this->rowsize; i++)
  {
    for (int j = 0; j < this->colsize; j++)
    {
      std::cout << ' ' << this->table[i][j] << ' ';
    }
    std::cout << '\n';
  }

  std::cout << std::endl;
```

```
}

WordPuzzleSolution WordPuzzle::findWord(std::string word) const
{
  WordPuzzleSolution solution(*this, word);

  if (word.empty())
    return solution;

  auto wordLen = word.size();

  for (int i = 0; i < this->rowsize; i++)
  {
    for (int j = 0; j < this->colsize; j++)
    {
      solution.compCount++;
      if (this->table[i][j] == word[0])
      {
        int k;

        // horizontal left-to-right
        k = 1;
        while (j + k < this->colsize && k < wordLen)
        {
          solution.compCount++;
          if (this->table[i][j + k] != word[k])
            break;

          k++;
        }

        if (k == wordLen)
        {
          solution.set(SolutionType::Left, i, j);
          return solution;
        }

        // horizontal right-to-left
        k = 1;
        while (j - k >= 0 && k < wordLen)
        {
          solution.compCount++;
          if (this->table[i][j - k] != word[k])
            break;

          k++;
        }
```

```
        if (k == wordLen)
        {
          solution.set(SolutionType::Right, i, j);
          return solution;
        }

        // vertical top-to-bottom
        k = 1;
        while (i + k < this->rowsize && k < wordLen)
        {
          solution.compCount++;
          if (this->table[i + k][j] != word[k])
            break;

          k++;
        }

        if (k == wordLen)
        {
          solution.set(SolutionType::Top, i, j);
          return solution;
        }

        // vertical bottom-to-top
        k = 1;
        while (i - k >= 0 && k < wordLen)
        {
          solution.compCount++;
          if (this->table[i - k][j] != word[k])
            break;

          k++;
        }

        if (k == wordLen)
        {
          solution.set(SolutionType::Bottom, i, j);
          return solution;
        }

        // diagonal top-left to bottom-right
        k = 1;
        while (i + k < this->rowsize &&
               j + k < this->colsize &&
               k < wordLen)
        {
          solution.compCount++;
          if (this->table[i + k][j + k] != word[k])
```

```
            break;

        k++;
      }

      if (k == wordLen)
      {
        solution.set(SolutionType::TopLeft, i, j);
        return solution;
      }

      // diagonal bottom-left to top-right
      k = 1;
      while (i - k >= 0 &&
             j + k < this->colsize &&
             k < wordLen)
      {
        solution.compCount++;
        if (this->table[i - k][j + k] != word[k])
          break;

        k++;
      }

      if (k == wordLen)
      {
        solution.set(SolutionType::BottomLeft, i, j);
        return solution;
      }

      // diagonal top-right to bottom-left
      k = 1;
      while (i + k < this->rowsize &&
             j - k >= 0 &&
             k < wordLen)
      {
        solution.compCount++;
        if (this->table[i + k][j - k] != word[k])
          break;

        k++;
      }

      if (k == wordLen)
      {
        solution.set(SolutionType::TopRight, i, j);
        return solution;
      }
```

```
        // diagonal bottom-right to top-left
        k = 1;
        while (i - k >= 0 &&
               j - k >= 0 &&
               k < wordLen)
        {
          solution.compCount++;
          if (this->table[i - k][j - k] != word[k])
            break;

          k++;
        }

        if (k == wordLen)
        {
          solution.set(SolutionType::BottomRight, i, j);
          return solution;
        }
      }
    }
  }

  return solution;
}

void WordPuzzleSolution::print() const
{
  std::cout << "> " << this->word << '\n';

  if (this->type == SolutionType::None)
  {
    std::cout << "Not found.\n";
  }
  else
  {
    std::cout << "Found with " << this->compCount << "
comparisons.\n";

    if (this->type == SolutionType::Left)
    {
      int k = 0;
      for (int i = 0; i < this->puzzle.rowsize; i++)
      {
        for (int j = 0; j < this->puzzle.colsize; j++)
        {
          if (i == this->i &&
              j == this->j + k &&
```

```
            k < this->word.size())
        {
          std::cout << ' ' << this->word[k] << ' ';
          k++;
        }
        else
        {
          std::cout << " - ";
        }
      }
      std::cout << '\n';
    }
  }
  else if (this->type == SolutionType::Right)
  {
    int k = this->word.size() - 1;
    for (int i = 0; i < this->puzzle.rowsize; i++)
    {
      for (int j = 0; j < this->puzzle.colsize; j++)
      {
        if (i == this->i &&
            j + k == this->j &&
            k >= 0)
        {
          std::cout << ' ' << this->word[k] << ' ';
          k--;
        }
        else
        {
          std::cout << " - ";
        }
      }
      std::cout << '\n';
    }
  }
  else if (this->type == SolutionType::Top)
  {
    int k = 0;
    for (int i = 0; i < this->puzzle.rowsize; i++)
    {
      for (int j = 0; j < this->puzzle.colsize; j++)
      {
        if (i == this->i + k &&
            j == this->j &&
            k < this->word.size())
        {
          std::cout << ' ' << this->word[k] << ' ';
          k++;
```

```
        }
        else
        {
          std::cout << " - ";
        }
      }
      std::cout << '\n';
    }
  }
  else if (this->type == SolutionType::Bottom)
  {
    int k = this->word.size() - 1;
    for (int i = 0; i < this->puzzle.rowsize; i++)
    {
      for (int j = 0; j < this->puzzle.colsize; j++)
      {
        if (i + k == this->i &&
            j == this->j &&
            k >= 0)
        {
          std::cout << ' ' << this->word[k] << ' ';
          k--;
        }
        else
        {
          std::cout << " - ";
        }
      }
      std::cout << '\n';
    }
  }
  else if (this->type == SolutionType::TopLeft)
  {
    int k = 0;
    for (int i = 0; i < this->puzzle.rowsize; i++)
    {
      for (int j = 0; j < this->puzzle.colsize; j++)
      {
        if (i == this->i + k &&
            j == this->j + k &&
            k < this->word.size())
        {
          std::cout << ' ' << this->word[k] << ' ';
          k++;
        }
        else
        {
          std::cout << " - ";
```

```
        }
      }
      std::cout << '\n';
    }
  }
  else if (this->type == SolutionType::BottomLeft)
  {
    int k = this->word.size() - 1;
    for (int i = 0; i < this->puzzle.rowsize; i++)
    {
      for (int j = 0; j < this->puzzle.colsize; j++)
      {
        if (i == this->i - k &&
            j == this->j + k &&
            k < this->word.size())
        {
          std::cout << ' ' << this->word[k] << ' ';
          k--;
        }
        else
        {
          std::cout << " - ";
        }
      }
      std::cout << '\n';
    }
  }
  else if (this->type == SolutionType::TopRight)
  {
    int k = 0;
    for (int i = 0; i < this->puzzle.rowsize; i++)
    {
      for (int j = 0; j < this->puzzle.colsize; j++)
      {
        if (i == this->i + k &&
            j == this->j - k &&
            k < this->word.size())
        {
          std::cout << ' ' << this->word[k] << ' ';
          k++;
        }
        else
        {
          std::cout << " - ";
        }
      }
      std::cout << '\n';
    }
```

```
    }
    else if (this->type == SolutionType::BottomRight)
    {
      int k = this->word.size() - 1;
      for (int i = 0; i < this->puzzle.rowsize; i++)
      {
        for (int j = 0; j < this->puzzle.colsize; j++)
        {
          if (i == this->i - k &&
              j == this->j - k &&
              k < this->word.size())
          {
            std::cout << ' ' << this->word[k] << ' ';
            k--;
          }
          else
          {
            std::cout << " - ";
          }
        }
        std::cout << '\n';
      }
    }
  }

  std::cout << std::endl;
}
```

BAB III
TESTING

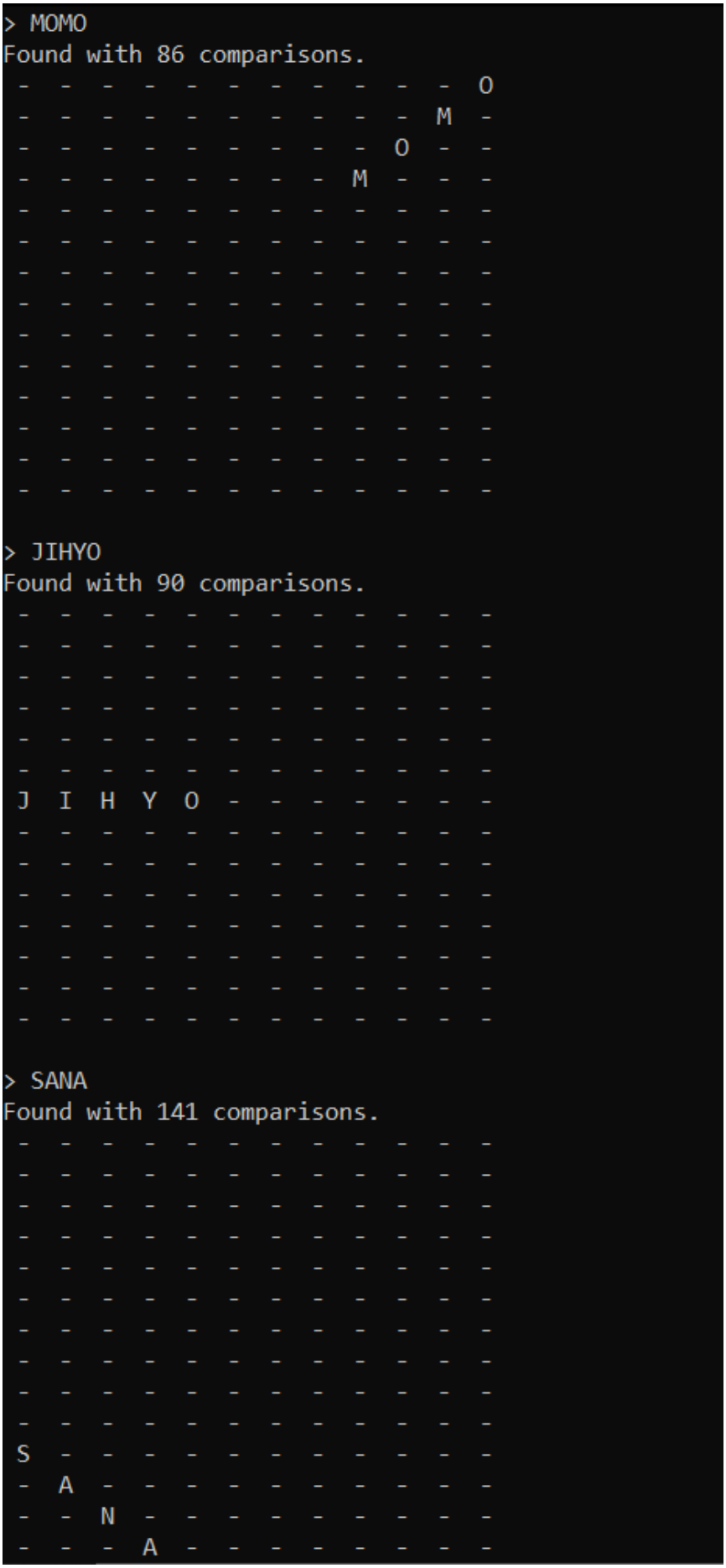
Testing dilakukan pada ASUS VivoBook X415EP_A416EP, sistem operasi Microsoft Windows x64 10.0.19044, prosesor Intel Core i7-1165G7 @ 2.8GHz.

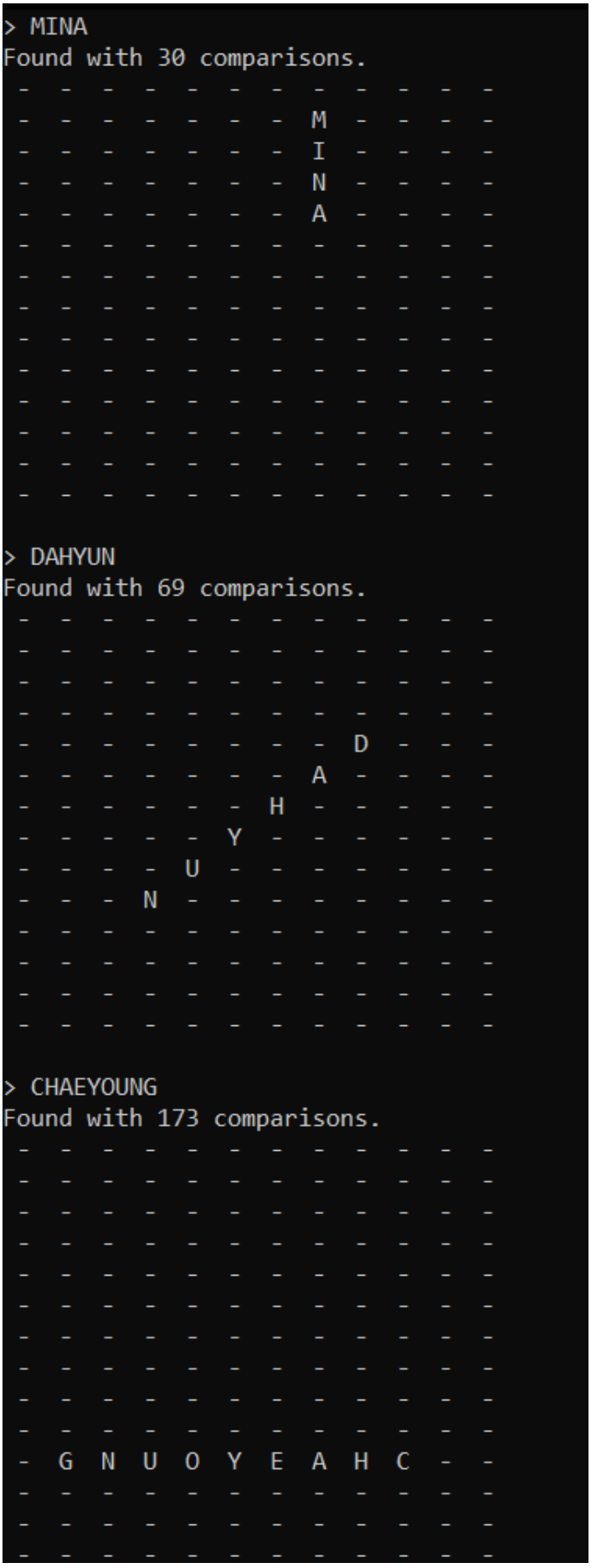
A. sm-1.txt

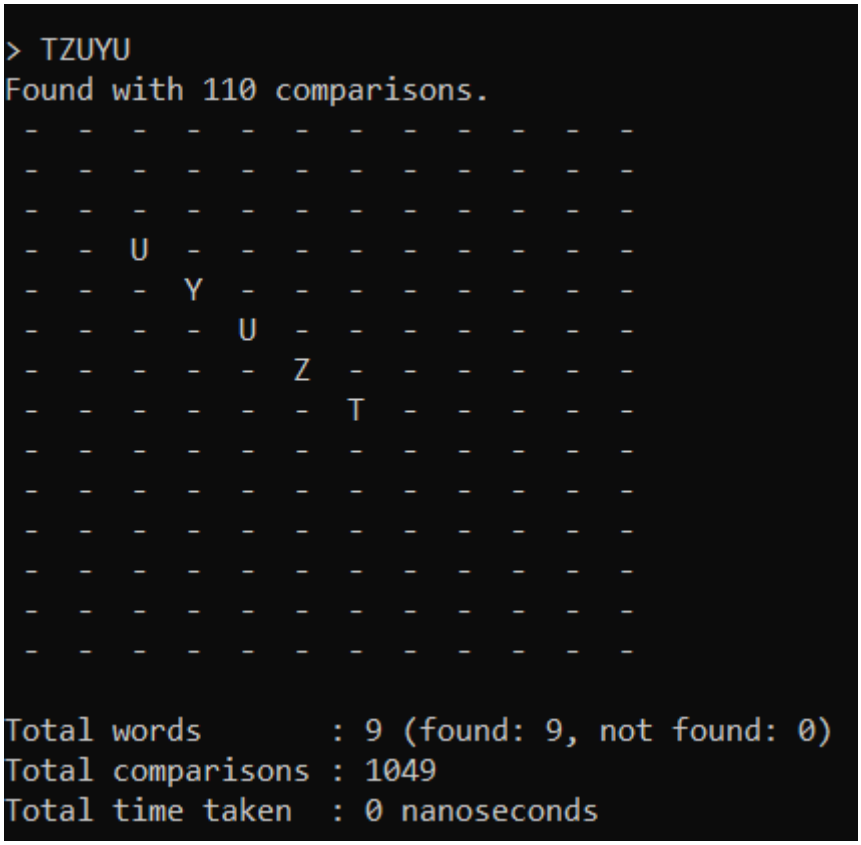
```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/sm-1.txt
          14 x 12 PUZZLE
 X  J  U  U  L  Y  M  S  I  U  O  O
 V  E  Z  O  E  X  W  M  O  P  M  G
 A  K  L  Q  M  Y  R  I  C  O  C  P
 K  J  U  G  N  Z  G  N  M  G  Y  V
 W  M  L  Y  K  O  X  A  D  Q  N  F
 N  T  P  A  U  Z  E  A  R  D  O  Z
 J  I  H  Y  O  Z  H  Y  Q  V  E  V
 V  P  J  W  J  Y  T  T  A  S  Y  C
 C  A  L  C  U  K  I  X  O  N  G  P
 G  Q  B  N  T  P  K  D  X  A  N  Y
 S  G  N  U  O  Y  E  A  H  C  O  H
 C  A  K  N  Z  X  V  X  D  E  E  I
 H  W  N  A  V  B  T  K  N  U  J  Y
 I  Q  A  A  N  K  G  M  C  Y  X  S

> NAYEON
Found with 149 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  N  -  -  -  -  -  -  -
 -  -  -  -  -  O  -  -  -  -  -  -
 -  -  -  -  -  -  E  -  -  -  -  -
 -  -  -  -  -  -  -  Y  -  -  -  -
 -  -  -  -  -  -  -  -  A  -  -  -
 -  -  -  -  -  -  -  -  -  N  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -

> JEONGYEON
Found with 201 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  N  -
 -  -  -  -  -  -  -  -  -  -  O  -
 -  -  -  -  -  -  -  -  -  -  E  -
 -  -  -  -  -  -  -  -  -  -  Y  -
 -  -  -  -  -  -  -  -  -  -  G  -
 -  -  -  -  -  -  -  -  -  -  N  -
 -  -  -  -  -  -  -  -  -  -  O  -
 -  -  -  -  -  -  -  -  -  -  E  -
 -  -  -  -  -  -  -  -  -  -  J  -
 -  -  -  -  -  -  -  -  -  -  -  -
```


> MOMO
Found with 86 comparisons.
> JIHYO
Found with 90 comparisons.
> SANA
Found with 141 comparisons.


> MINA
Found with 30 comparisons.
> DAHYUN
Found with 69 comparisons.
> CHAEYOUNG
Found with 173 comparisons.


> TZUYU
Found with 110 comparisons.
Total words : 9 (found: 9, not found: 0)
Total comparisons : 1049
Total time taken : 0 nanoseconds

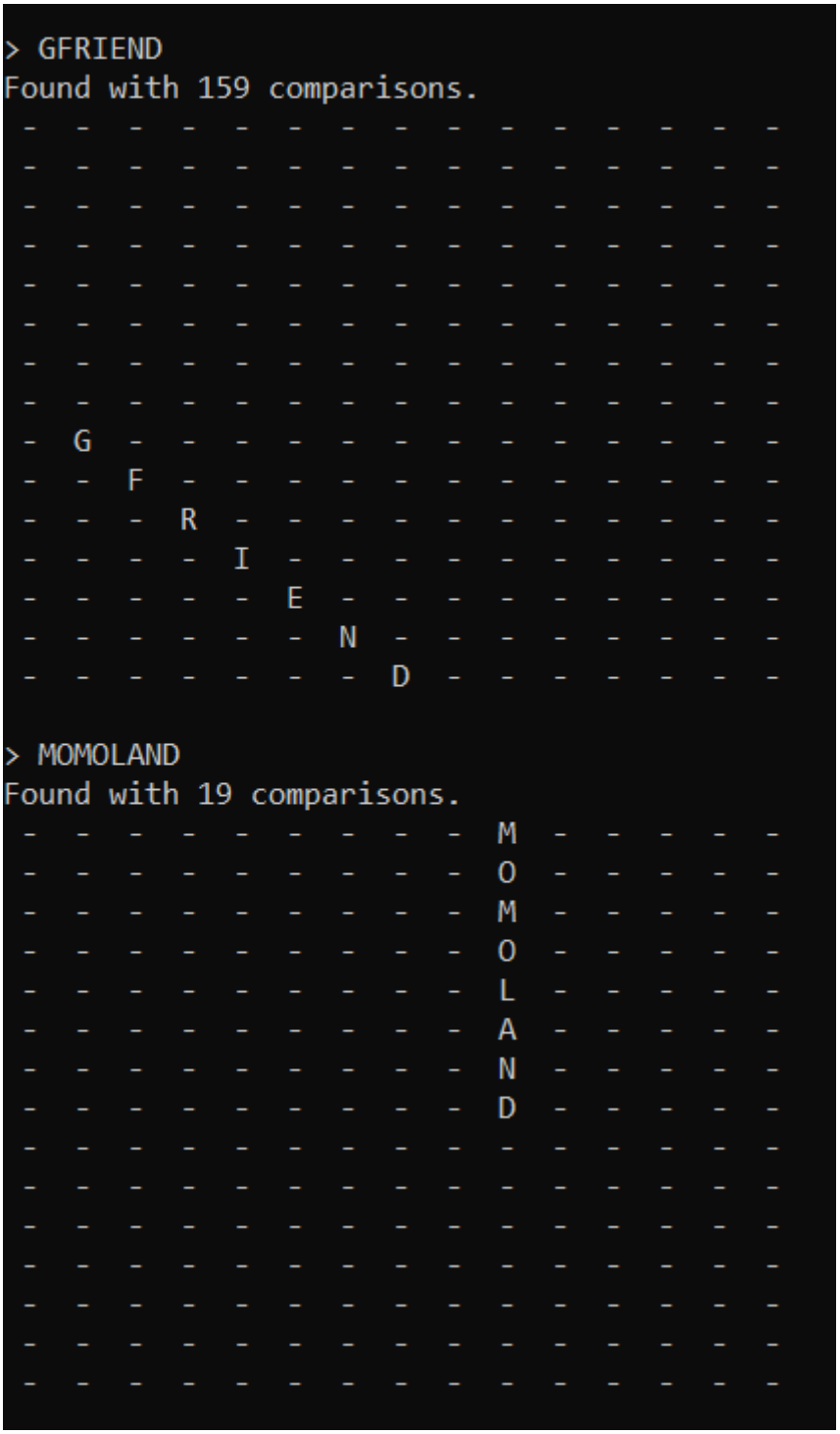
B. sm-2.txt

```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/sm-2.txt
               15 x 15 PUZZLE
 W  D  I  X  E  H  C  Y  G  M  E  W  G  K  D
 M  V  T  T  G  V  O  Q  R  O  P  W  I  N  R
 I  S  Z  A  A  P  Q  U  R  M  R  O  P  I  E
 P  B  O  I  A  T  Y  L  Y  O  I  Y  T  P  A
 W  A  D  K  K  O  U  S  L  L  I  A  Y  K  M
 O  H  M  Y  G  I  R  L  P  A  E  I  N  C  C
 D  O  U  K  M  P  J  Z  T  N  U  U  E  A  A
 B  F  M  C  I  H  R  E  V  D  H  V  C  L  T
 C  G  K  A  F  A  V  E  V  E  V  U  I  B  C
 B  Q  F  U  M  L  P  Q  V  M  Q  H  W  I  H
 B  G  W  R  E  A  A  L  U  J  C  A  T  T  E
 S  G  Y  V  I  H  M  O  A  L  J  Y  Q  R  R
 P  H  D  H  T  E  C  E  A  R  V  R  Z  H  S
 S  E  E  Q  S  R  N  D  Y  Y  M  M  Q  Z  L
 R  S  Z  M  M  E  V  D  I  O  B  H  Z  F  E

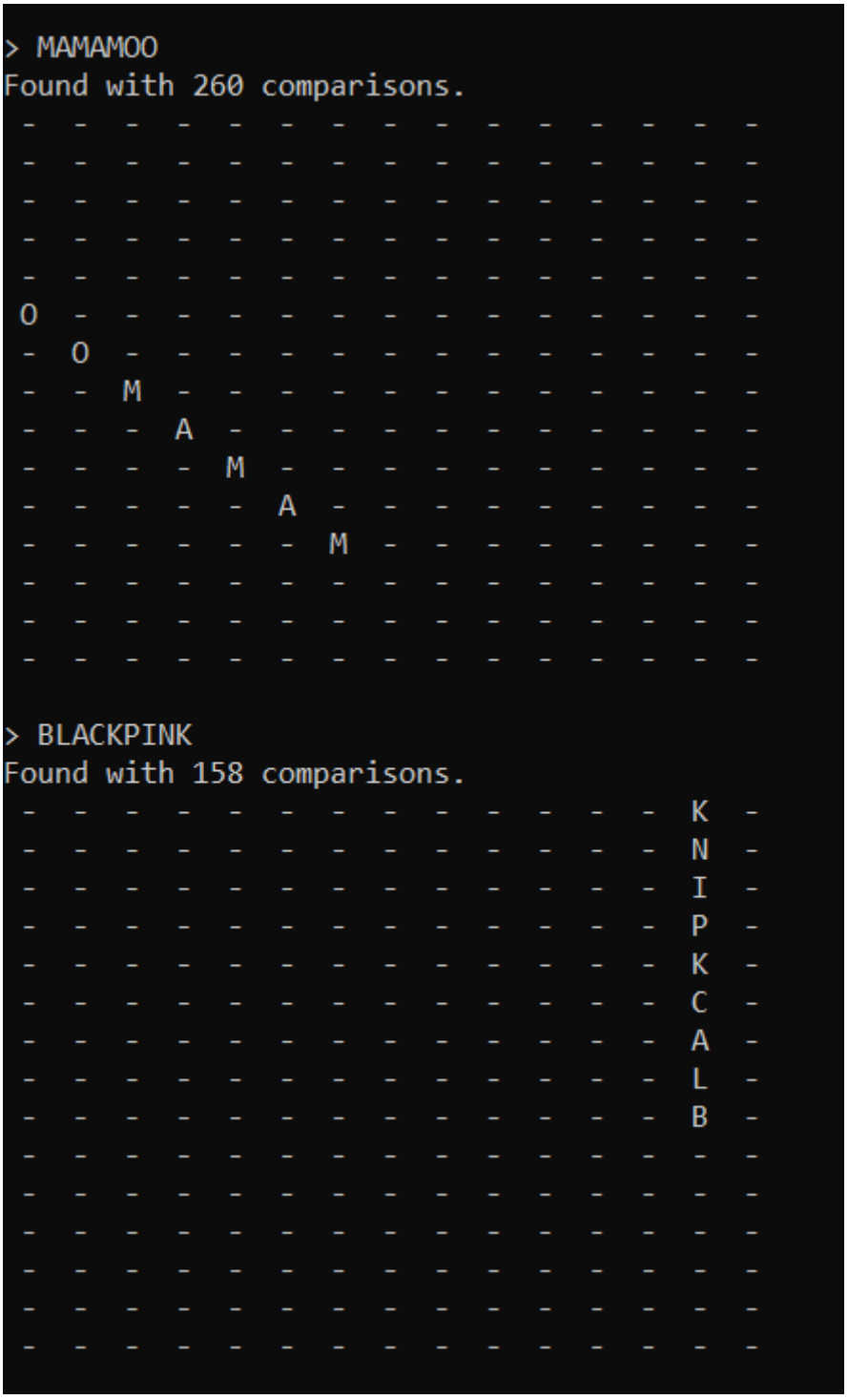
> AOA
Found with 42 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  A  -  -  -  -  -  -  -  -  -  -  -
 -  -  O  -  -  -  -  -  -  -  -  -  -  -  -
 -  A  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -

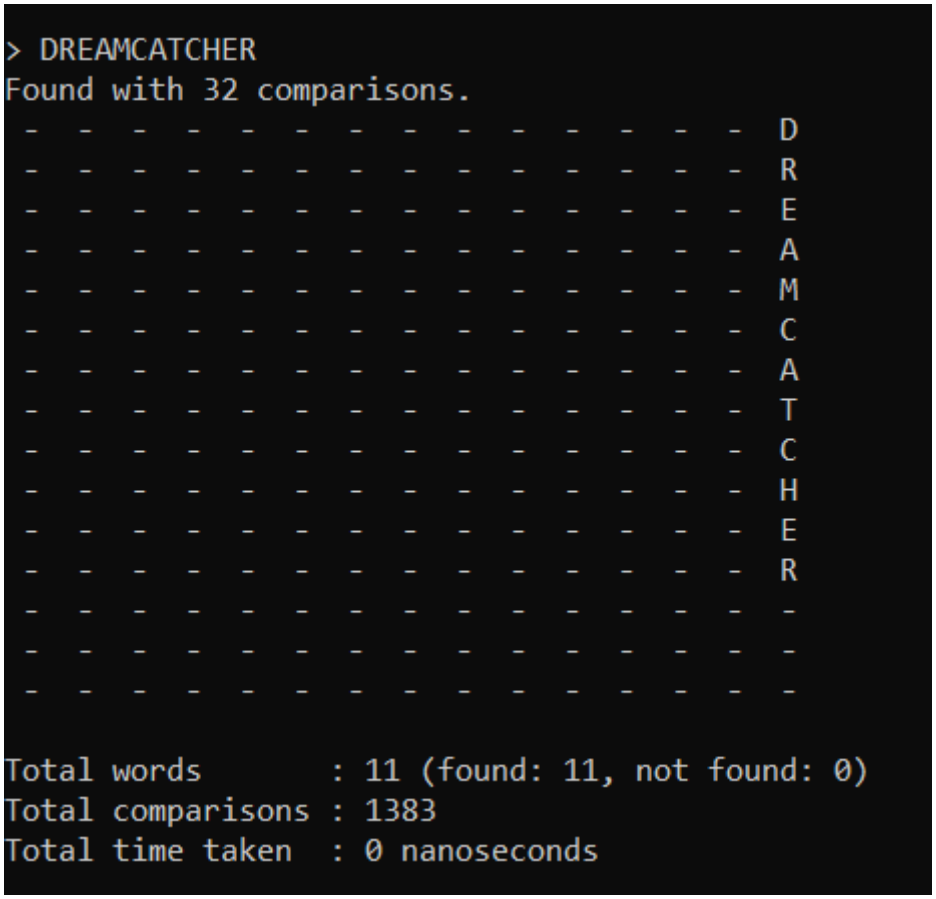
> TWICE
Found with 215 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  E  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  C  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  I  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  W  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  T  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
```


> REDVELVET
Found with 317 comparisons.
> OHMYGIRL
Found with 131 comparisons.


> GFRIEND
Found with 159 comparisons.
> MOMOLAND
Found with 19 comparisons.


> IOI
Found with 41 comparisons.
> EXID
Found with 9 comparisons.
D I X E

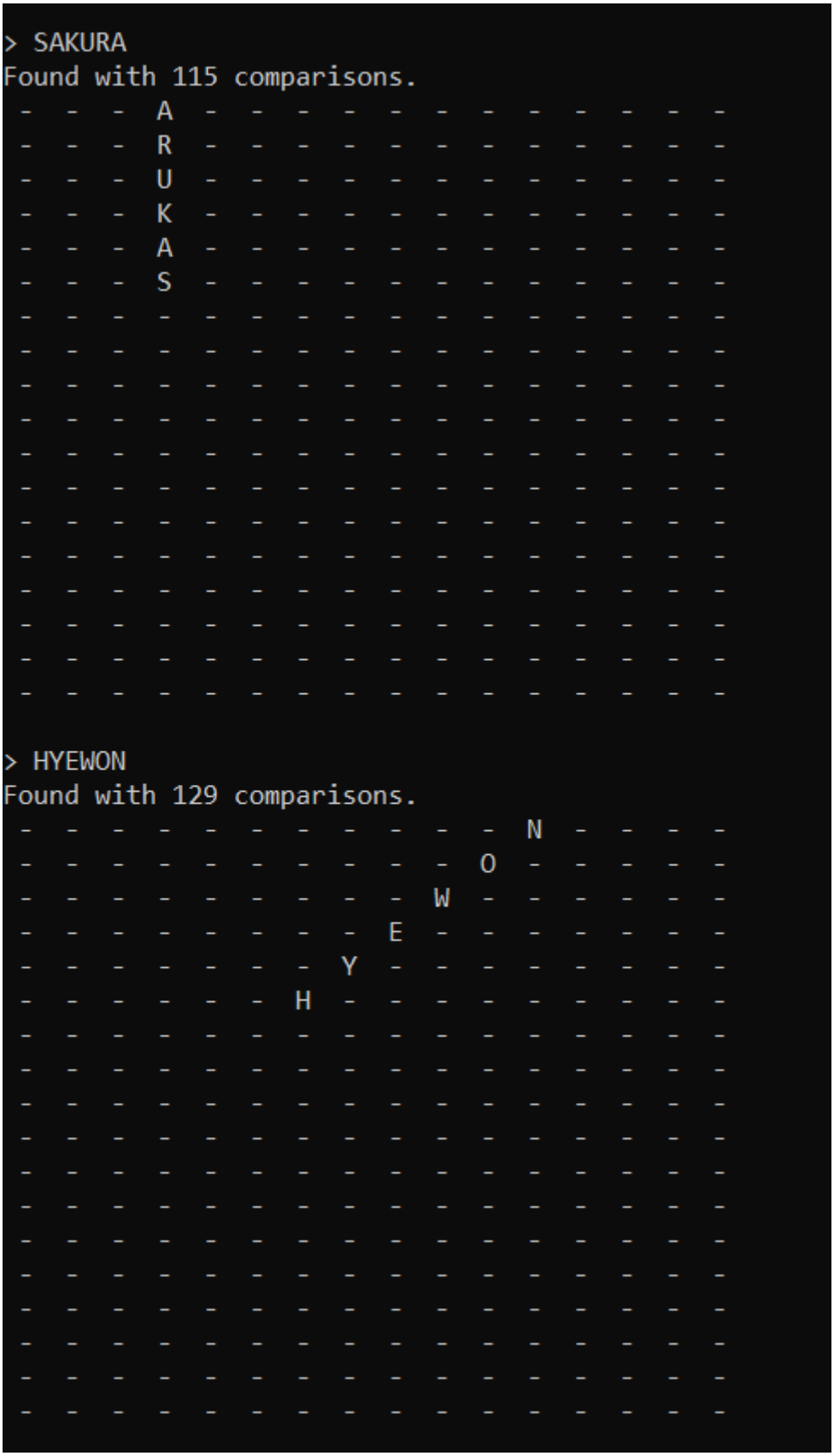

> MAMAMOO
Found with 260 comparisons.
> BLACKPINK
Found with 158 comparisons.

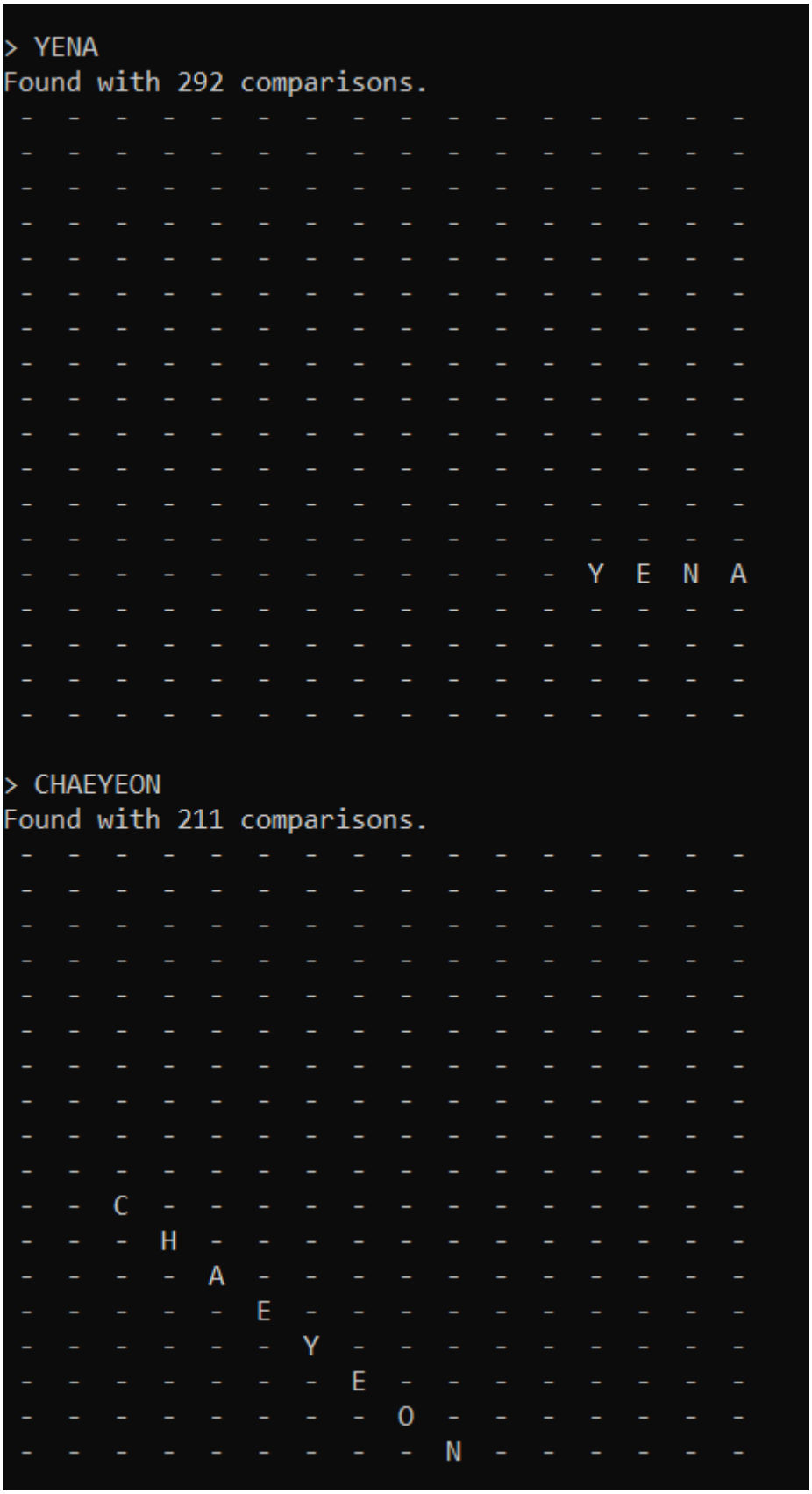

> DREAMCATCHER
Found with 32 comparisons.
D
R
E
A
M
C
A
T
C
H
E
R
Total words : 11 (found: 11, not found: 0)
Total comparisons : 1383
Total time taken : 0 nanoseconds

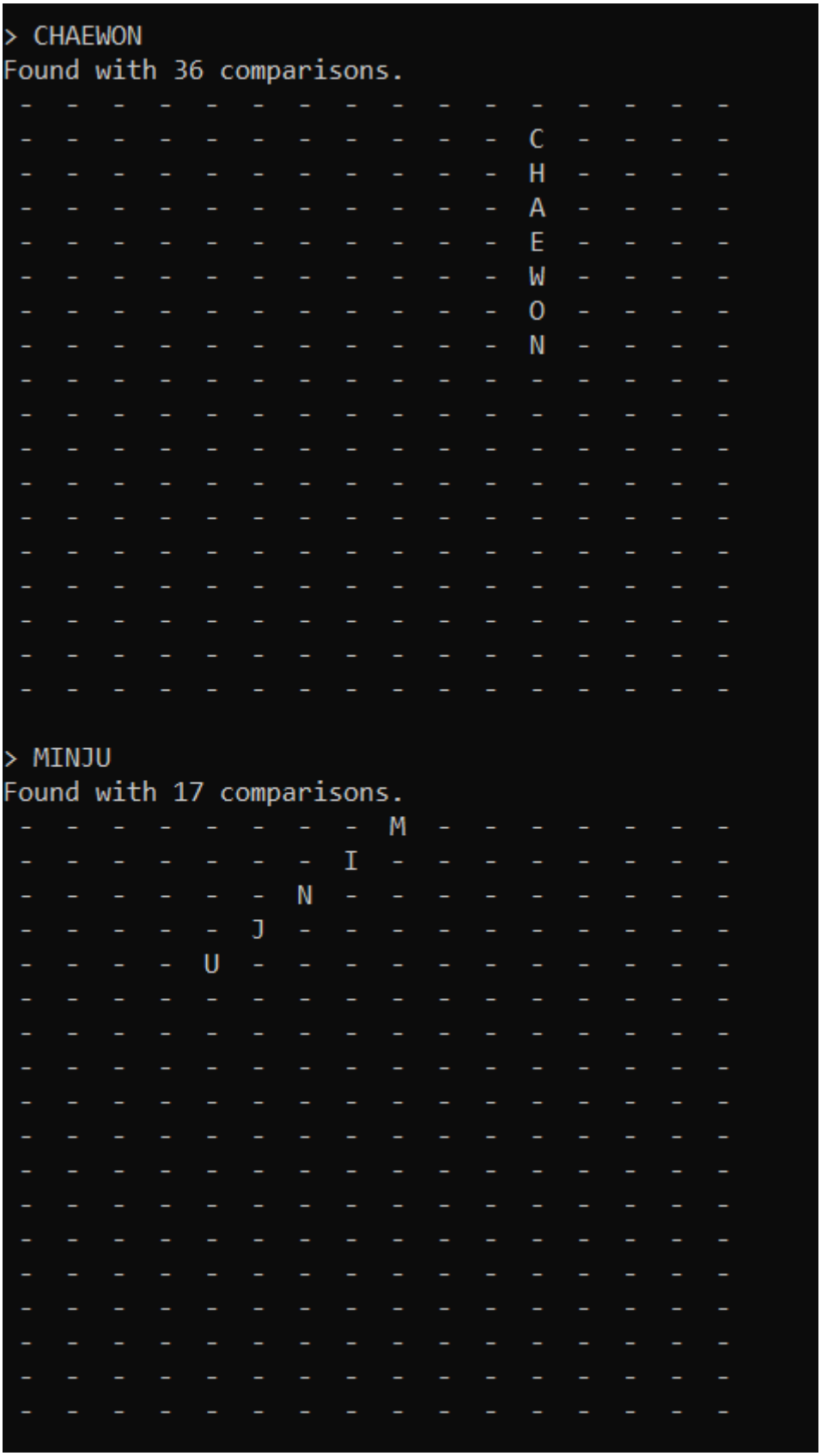
C. sm-3.txt

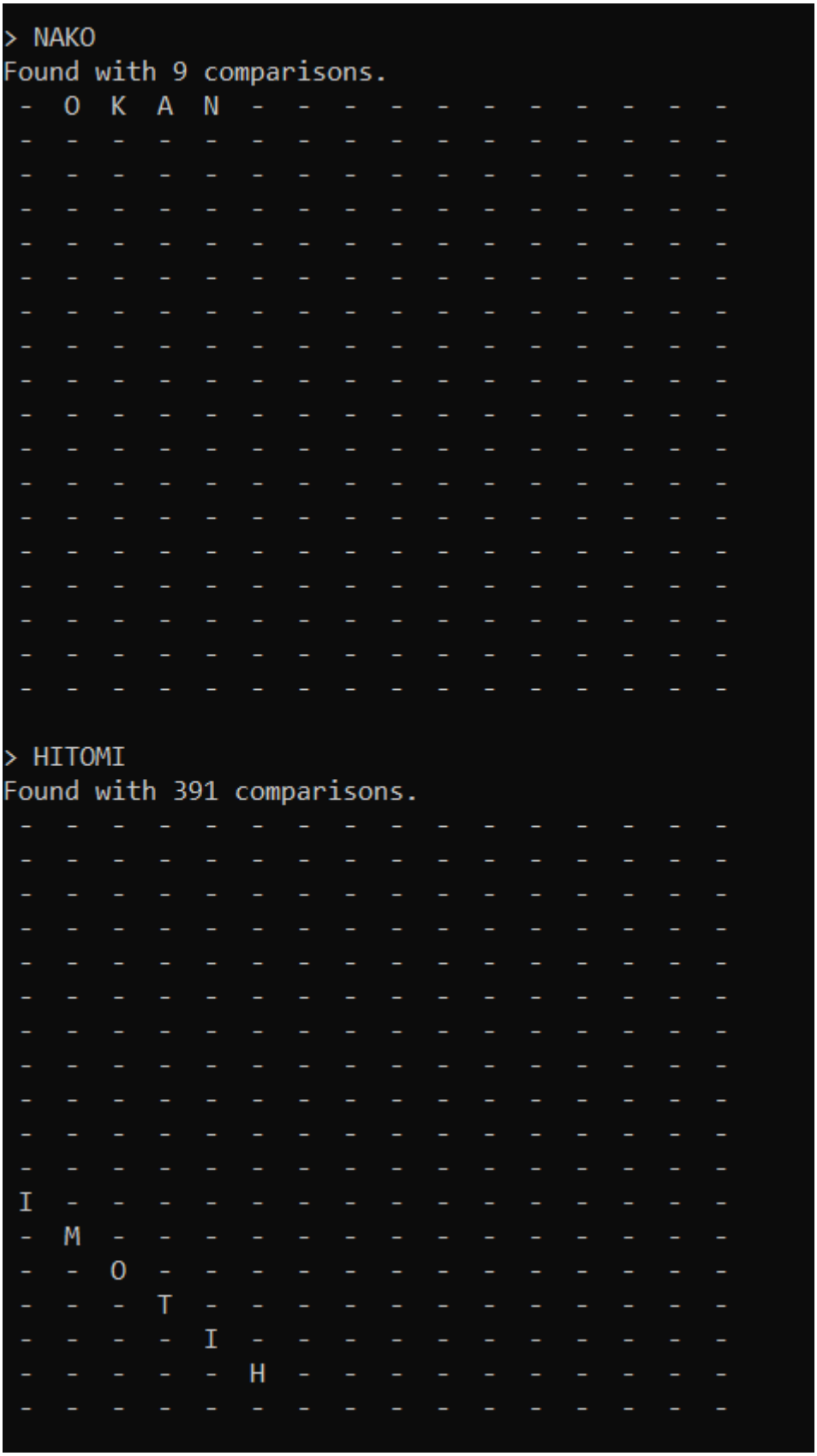
```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/sm-3.txt
                18 x 16 PUZZLE
 I  O  K  A  N  S  Y  Z  M  O  B  N  L  X  I  Q
 Z  L  W  R  H  R  Z  I  W  U  O  C  V  C  J  E
 E  R  F  U  N  J  N  V  X  W  I  H  B  W  V  K
 I  J  D  K  K  J  Q  J  E  B  R  A  T  B  H  E
 J  T  S  A  U  H  K  Y  B  A  U  E  S  Q  I  N
 N  U  K  S  B  G  H  X  X  J  Y  W  P  N  W  L
 W  O  N  Y  O  U  N  G  I  L  R  O  Q  H  J  X
 O  U  W  I  B  I  U  R  R  N  V  N  H  U  F  M
 L  O  L  F  N  Z  B  L  F  U  R  M  Z  C  C  X
 Z  D  K  F  Y  G  A  N  N  E  K  J  O  S  E  Y
 H  H  C  F  O  T  B  I  U  I  C  F  X  J  G  Q
 I  W  P  H  C  T  J  V  K  E  N  S  I  I  H  Q
 U  M  Z  I  A  U  R  A  V  L  W  H  D  Y  H  F
 Y  P  O  W  Y  E  L  V  T  Q  Z  A  Y  E  N  A
 V  A  X  T  B  W  Y  G  C  J  D  D  K  I  O  A
 B  I  C  P  I  S  F  E  C  C  I  R  S  Q  H  M
 R  Y  W  K  B  H  W  P  O  I  U  T  T  K  D  N
 C  G  E  Z  X  R  E  N  W  N  Z  A  A  W  T  O

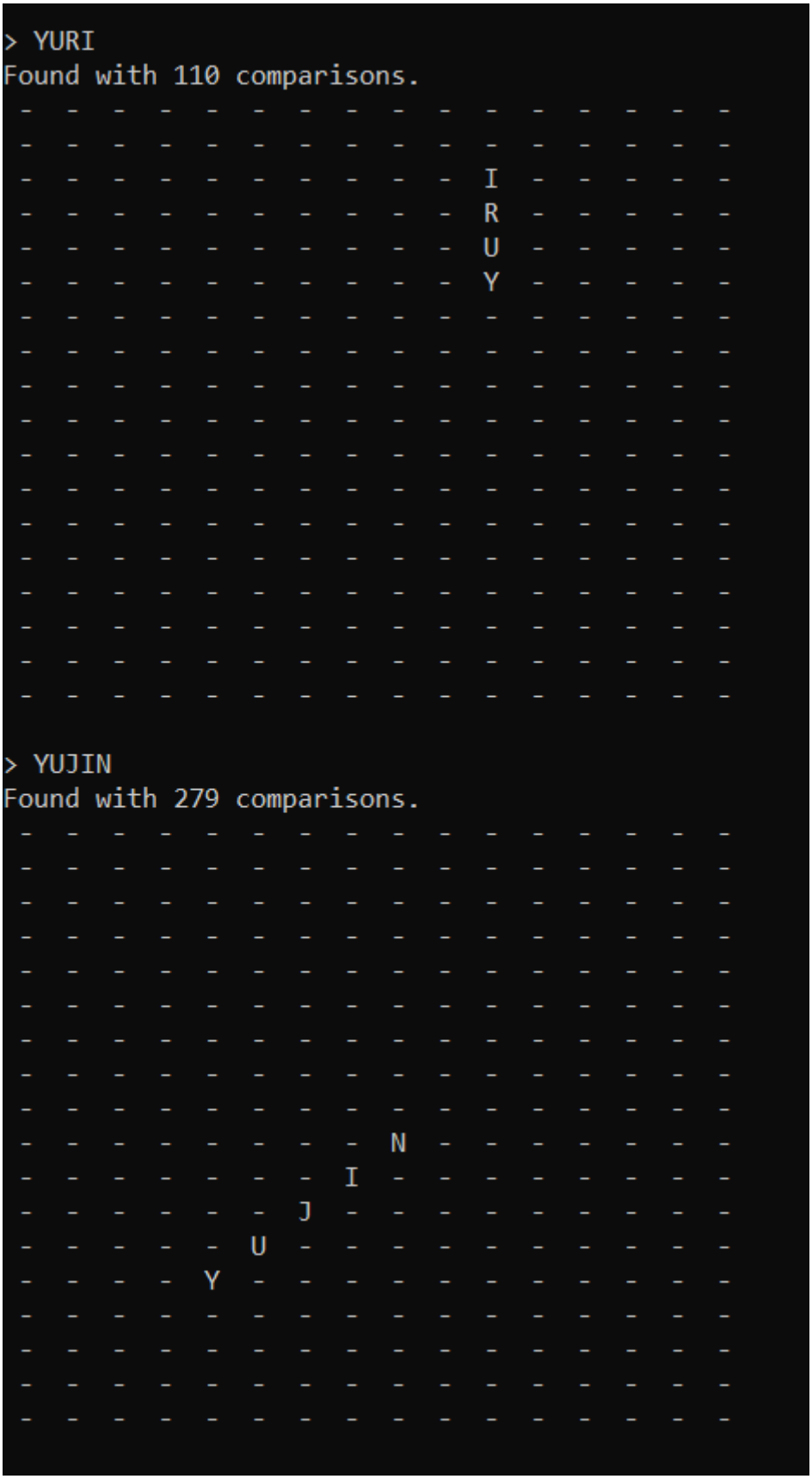
> EUNBI
Found with 248 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  I  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  B  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  N  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  U  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  E  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
```


> SAKURA
Found with 115 comparisons.
A
R
U
K
A
S
> HYEWON
Found with 129 comparisons.
N
O
W
E
Y
H


> YENA
Found with 292 comparisons.
Y E N A
> CHAEYEON
Found with 211 comparisons.
C
H
A
E
Y
E
O
N


> CHAEWON
Found with 36 comparisons.
C
H
A
E
W
O
N
> MINJU
Found with 17 comparisons.
M
I
N
J
U


> NAKO
Found with 9 comparisons.
- O K A N - - - - - - - - - - -
> HITOMI
Found with 391 comparisons.
I - - - - - - - - - - - - - - -
- M - - - - - - - - - - - - - -
- - O - - - - - - - - - - - - -
- - - T - - - - - - - - - - - -
- - - - I - - - - - - - - - - -
- - - - - H - - - - - - - - - -


> YURI
Found with 110 comparisons.
> YUJIN
Found with 279 comparisons.

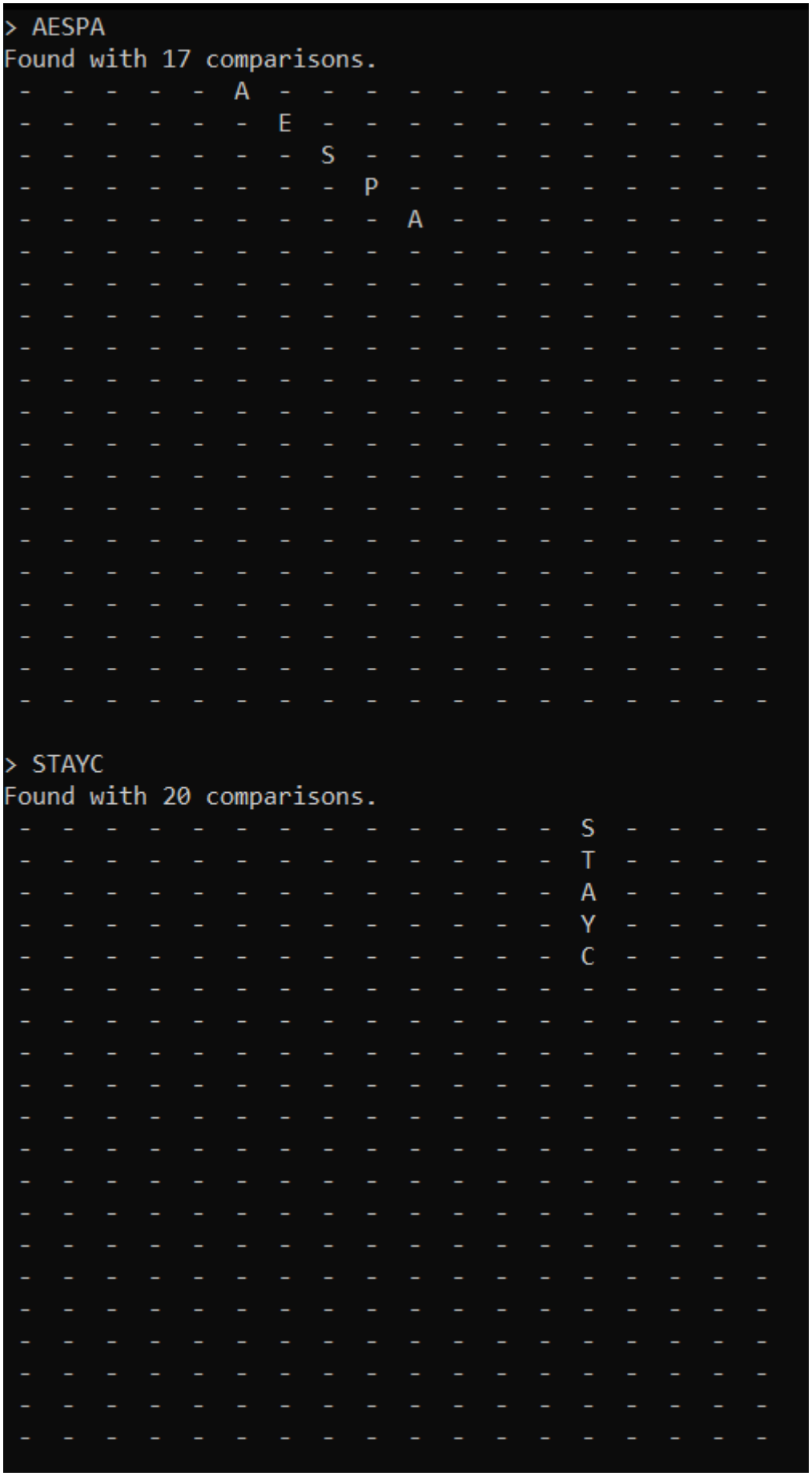

> WONYOUNG
Found with 155 comparisons.
W O N Y O U N G
Total words : 12 (found: 12, not found: 0)
Total comparisons : 1992
Total time taken : 56200 nanoseconds

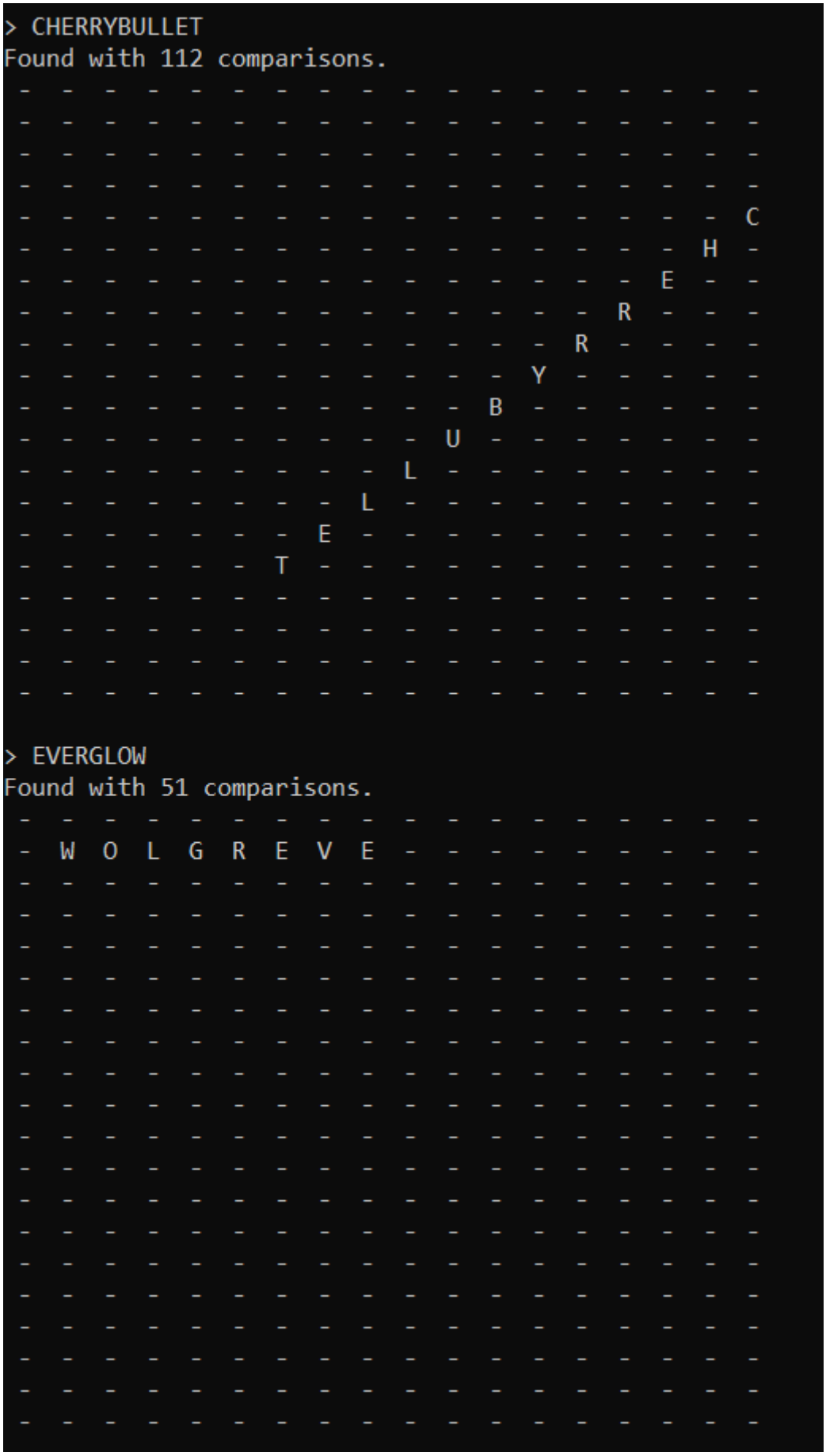
D. md-1.txt

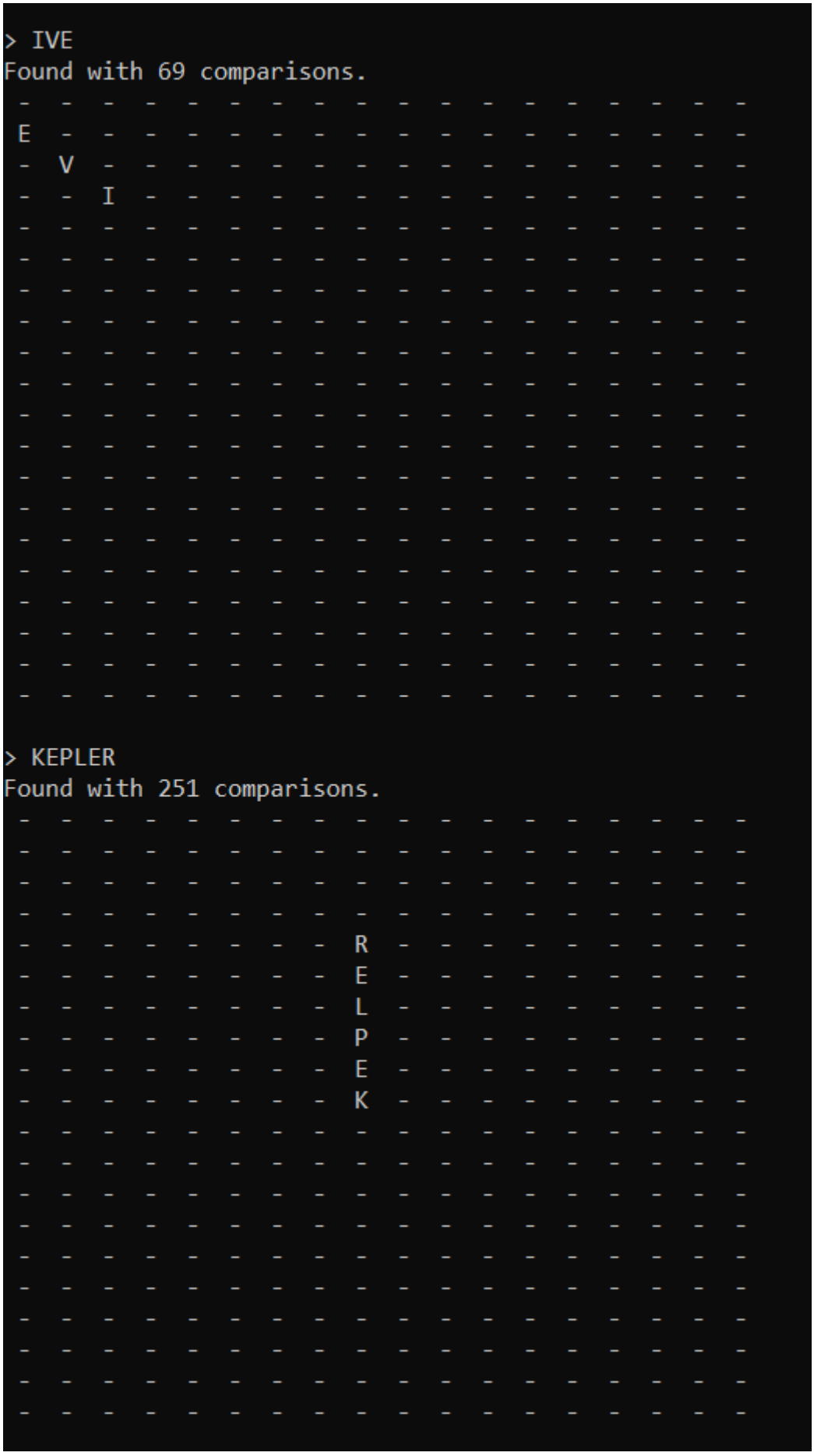
```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/md-1.txt
                  20 x 18 PUZZLE
 A  H  Z  R  U  A  T  D  X  B  Y  L  U  S  K  H  K  I
 E  W  O  L  G  R  E  V  E  L  J  O  B  T  D  K  Q  Q
 R  V  X  K  E  F  F  S  K  W  Z  O  T  A  Z  V  K  H
 U  Y  I  L  J  M  M  E  P  R  A  N  Z  Y  Q  A  P  W
 Y  G  D  J  K  E  E  S  R  A  I  A  F  C  I  L  I  C
 T  I  F  N  H  E  V  C  E  T  E  H  F  W  T  W  H  E
 G  F  L  S  W  X  H  Z  L  Z  I  W  A  B  O  E  D  N
 C  U  X  E  D  D  G  Q  P  F  N  Q  B  O  R  A  B  C
 F  O  G  N  B  N  H  W  E  B  O  M  O  R  L  D  Y  V
 O  P  X  O  K  K  C  G  K  E  Q  F  Y  T  U  H  I  R
 G  V  Z  Z  G  S  T  Q  O  W  V  B  P  W  Q  L  O  I
 J  R  W  I  B  W  G  W  Z  W  U  J  Z  Z  P  C  T  W
 Y  X  G  M  B  H  O  A  T  L  S  G  L  P  K  R  Q  C
 Z  L  O  F  T  F  Q  O  L  U  K  A  V  E  M  X  G  Q
 J  E  K  D  B  M  Q  E  A  M  U  S  T  H  G  I  L  J
 I  T  Z  Y  A  R  T  O  Z  H  L  P  M  A  K  C  O  Q
 D  V  I  E  G  C  I  V  V  J  U  J  T  D  K  D  E  Q
 H  B  N  C  J  H  C  I  G  N  A  T  U  R  E  Z  J  N
 M  U  Z  B  N  U  M  V  C  V  E  A  N  W  Q  C  F  E
 Q  Y  I  E  A  F  L  H  H  U  E  K  G  P  P  I  K  Z

> IZONE
Found with 274 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  E  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  N  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  O  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  Z  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  I  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
```

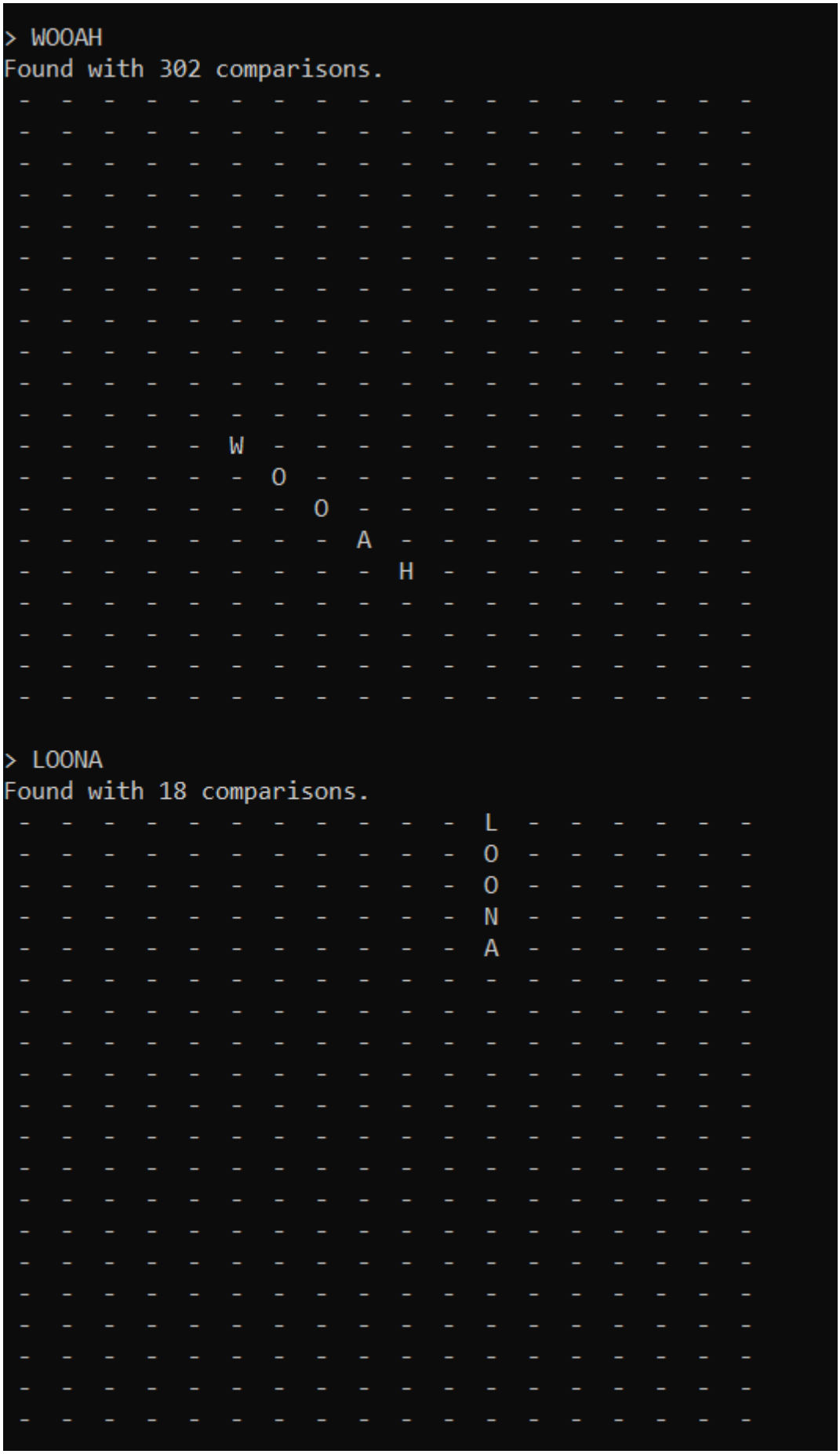

> GIDLE
Found with 135 comparisons.
E
L
D
I
G
> ITZY
Found with 358 comparisons.
I T Z Y

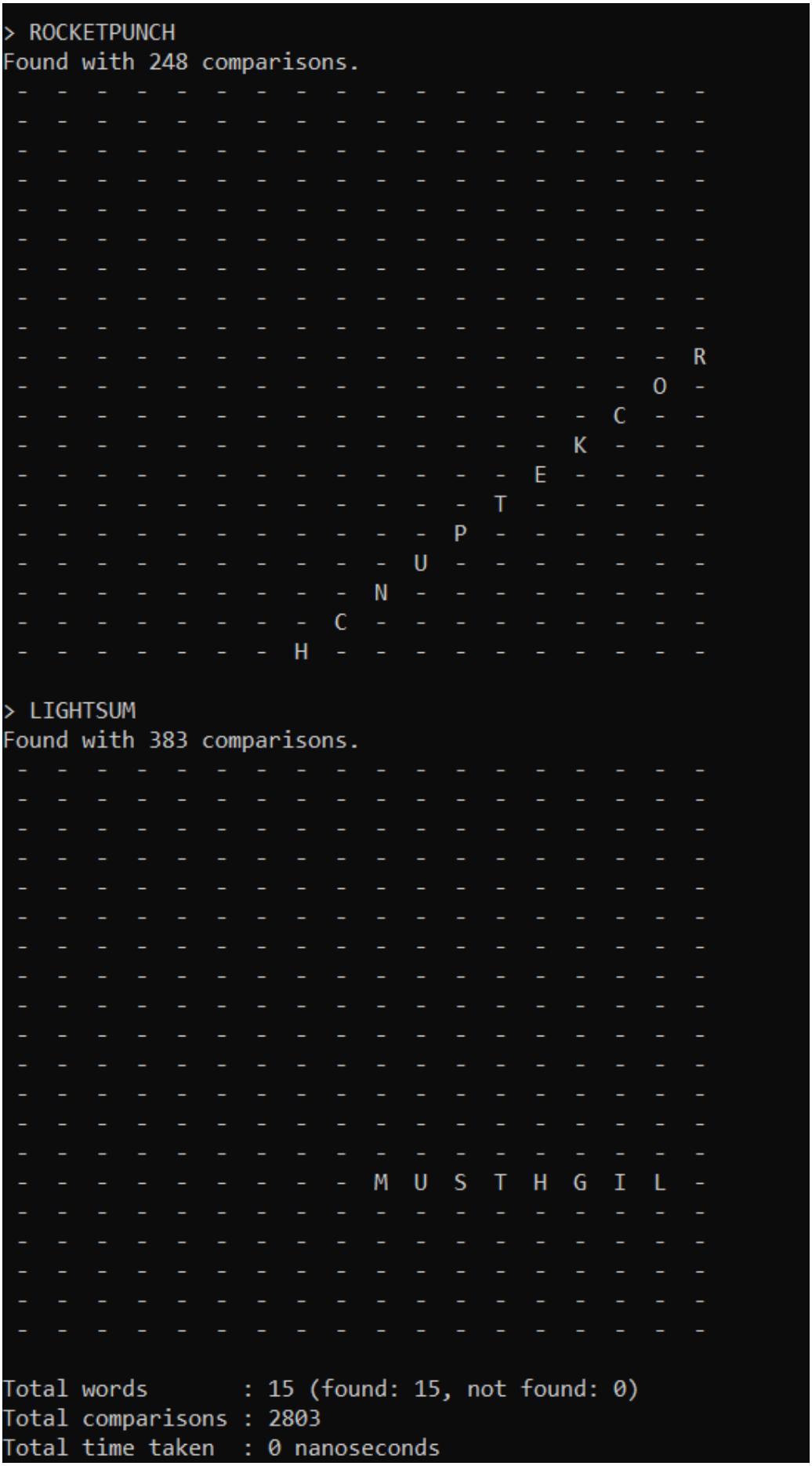

> AESPA
Found with 17 comparisons.
> STAYC
Found with 20 comparisons.


> CHERRYBULLET
Found with 112 comparisons.
> EVERGLOW
Found with 51 comparisons.


> IVE
Found with 69 comparisons.
E
V
I
> KEPLER
Found with 251 comparisons.
R
E
L
P
E
K


> WEEEKLY
Found with 163 comparisons.
> CIGNATURE
Found with 402 comparisons.
C I G N A T U R E


> WOOAH
Found with 302 comparisons.
> LOONA
Found with 18 comparisons.


> ROCKETPUNCH
Found with 248 comparisons.
> LIGHTSUM
Found with 383 comparisons.
Total words : 15 (found: 15, not found: 0)
Total comparisons : 2803
Total time taken : 0 nanoseconds

E. md-2.txt

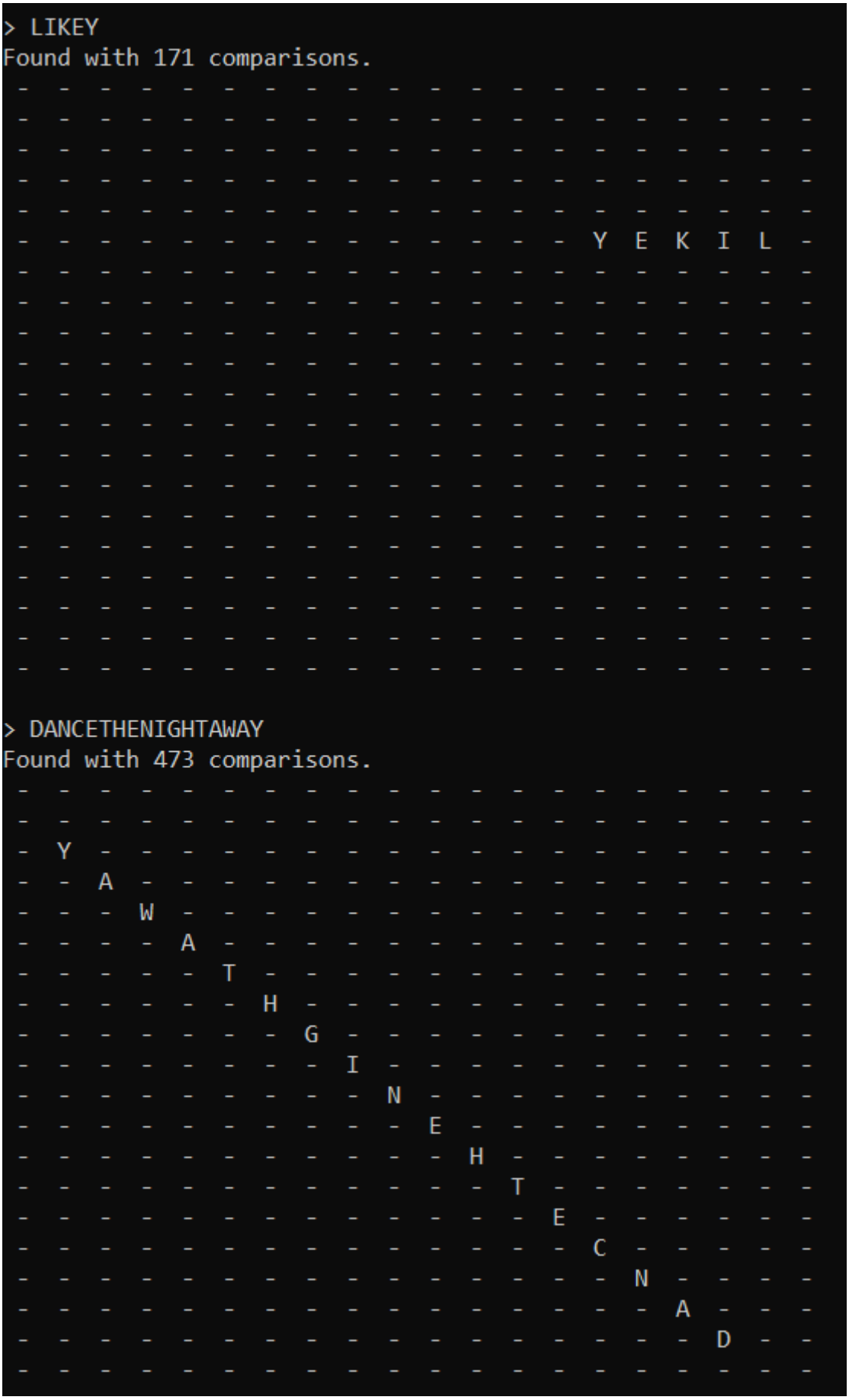
```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/md-2.txt
                    20 x 20 PUZZLE
 P  Y  L  L  F  T  E  F  R  Q  R  R  K  O  E  J  A  R  L  G
 G  T  E  S  I  E  S  P  G  E  E  N  B  V  M  H  G  L  K  P
 L  Y  F  S  E  K  F  I  K  O  O  Y  O  U  R  T  A  T  J  G
 O  P  A  B  O  W  E  A  T  C  C  L  V  N  O  P  L  W  Z  B
 S  E  Z  W  O  R  H  O  K  N  S  N  N  U  F  Z  K  J  S  M
 T  D  J  D  A  S  Y  K  O  I  E  I  E  F  Y  E  K  I  L  I
 B  G  R  F  T  T  N  E  T  H  L  I  D  Y  R  S  A  J  F  J
 S  S  J  R  Z  O  H  A  S  C  A  A  C  E  C  A  Y  E  P  I
 E  L  A  G  C  Z  H  G  Q  Z  C  H  Q  S  Y  C  C  S  C  T
 W  E  E  K  C  W  S  T  I  H  H  I  H  G  Z  L  A  A  E  U
 H  M  B  E  L  I  J  O  B  N  T  B  L  W  W  L  N  L  E  N
 K  U  P  B  F  E  E  L  S  P  E  C  I  A  L  T  D  G  R  H
 I  Y  O  Q  N  E  R  P  Y  Y  D  H  P  B  S  I  Y  A  F  G
 F  Y  K  C  Q  A  H  F  B  M  I  F  T  T  G  W  P  Q  L  U
 S  J  L  H  Y  G  J  T  N  A  L  E  O  E  V  U  O  Y  O  O
 M  O  R  E  A  N  D  M  O  R  E  P  D  X  C  F  P  M  H  D
 R  V  W  E  S  I  G  N  A  L  M  F  F  T  G  N  U  G  O  Z
 P  Z  V  R  E  Y  F  B  R  E  S  R  P  F  M  U  A  U  C  Q
 A  P  U  U  D  L  R  O  W  T  C  E  F  R  E  P  Y  D  L  Q
 S  G  L  P  G  D  X  V  P  L  P  G  Q  T  W  H  J  P  A  A

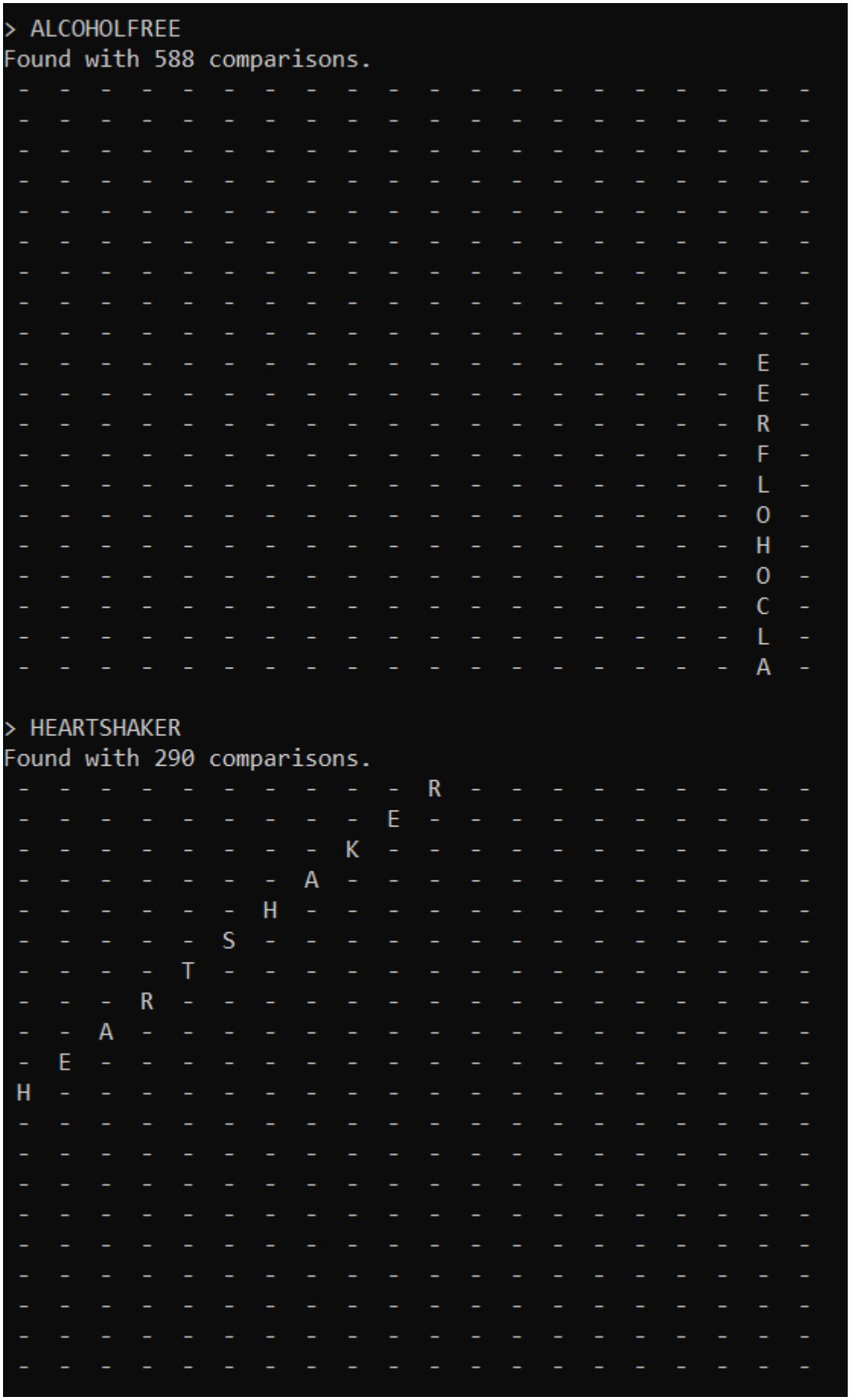
> THEFEELS
Found with 421 comparisons.
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 S  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  L  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  E  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  E  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  F  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  E  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  H  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  T  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
```


> CRYFORME
Found with 197 comparisons.
E
M
R
O
F
Y
R
C
> WHATISLOVE
Found with 231 comparisons.
E
V
O
L
S
I
T
A
H
W

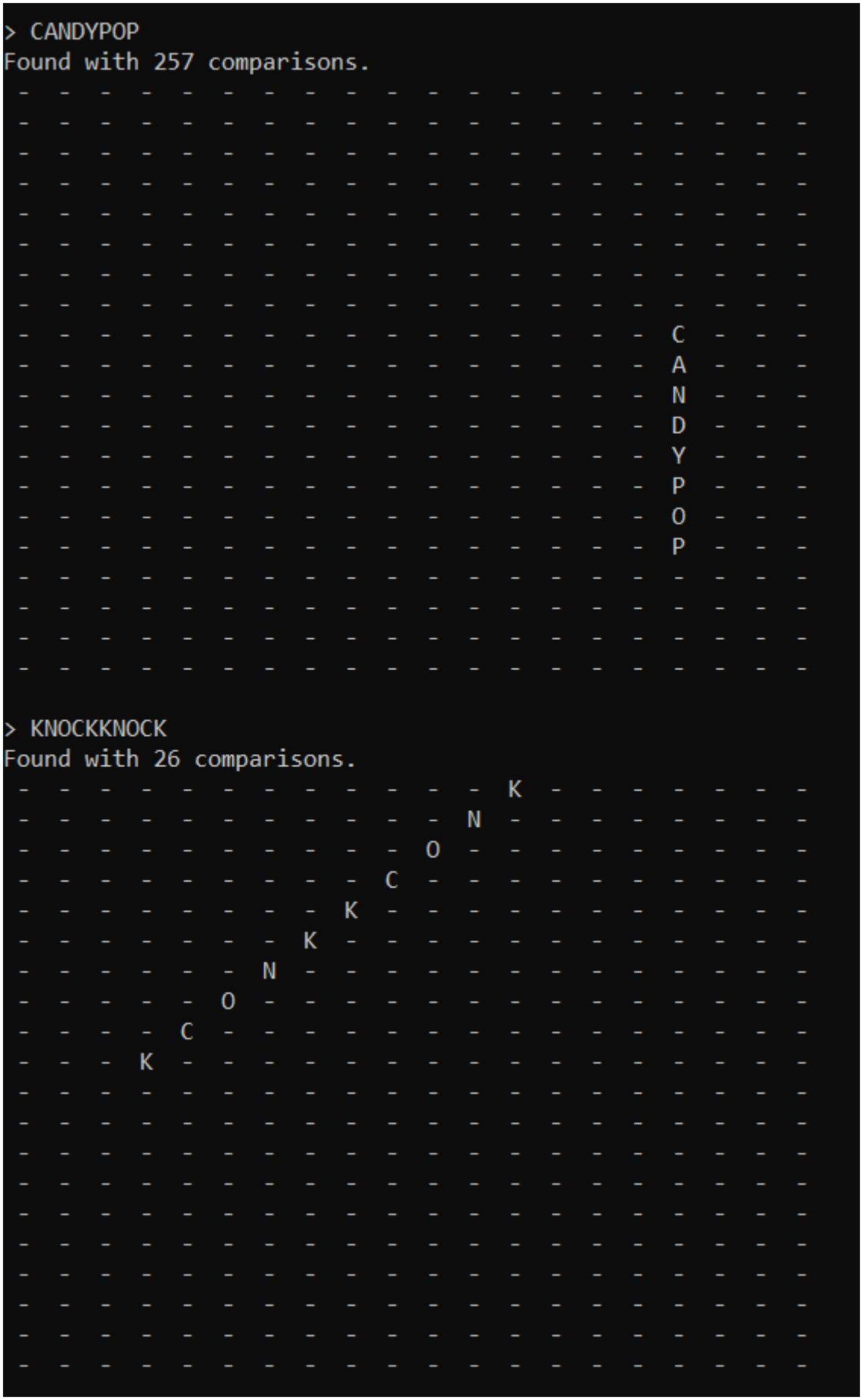

> FEELSPECIAL
Found with 301 comparisons.
F E E L S P E C I A L
> YESORYES
Found with 12 comparisons.
Y
E
S
O
R
Y
E
S


> CHEERUP
Found with 374 comparisons.
C
H
E
E
R
U
P
> ICANTSTOPME
Found with 227 comparisons.
I
C
A
N
T
S
T
O
P
M
E

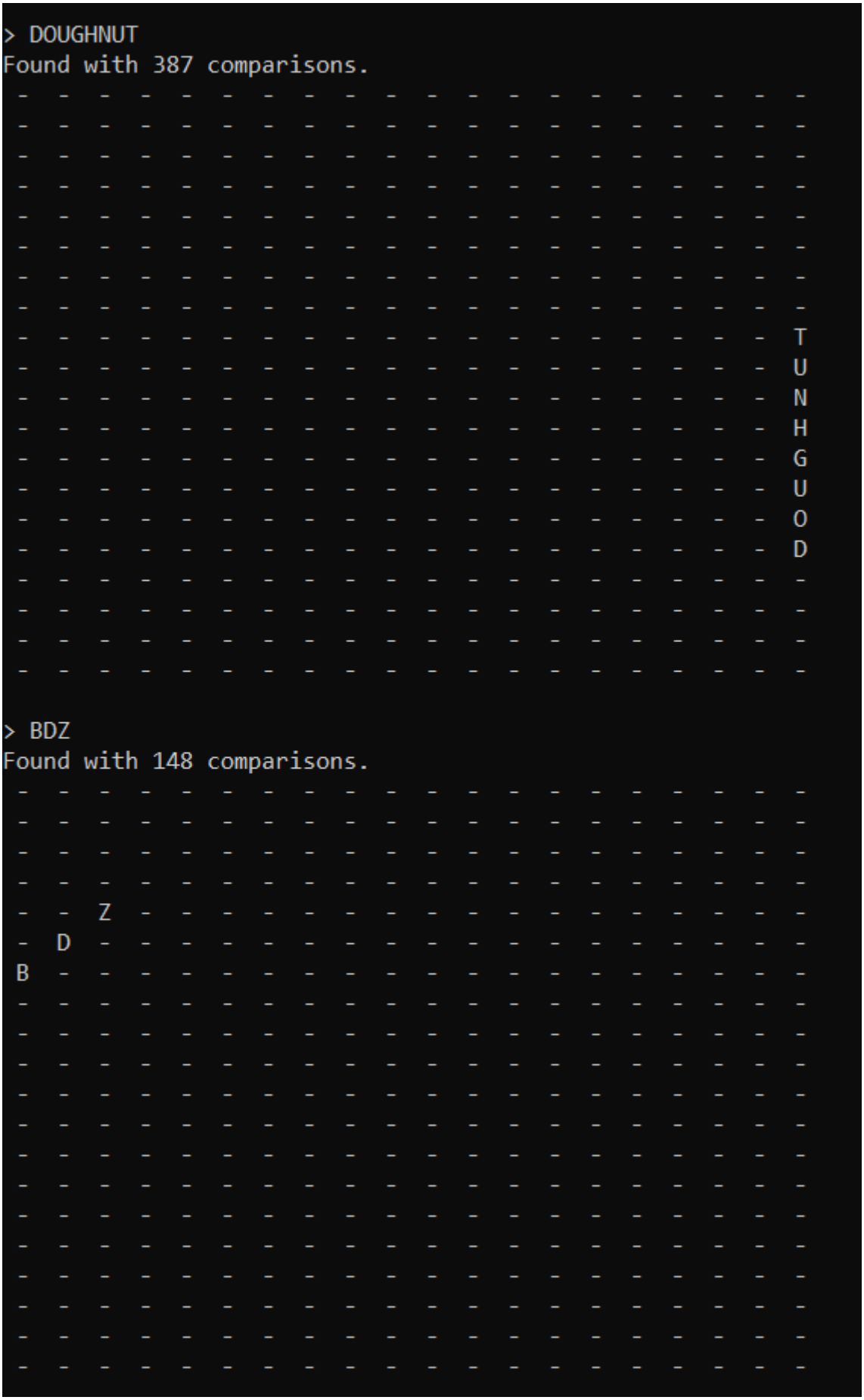

> LIKEY
Found with 171 comparisons.
Y E K I L
> DANCETHENIGHTAWAY
Found with 473 comparisons.
Y
A
W
A
T
H
G
I
N
E
H
T
E
C
N
A
D

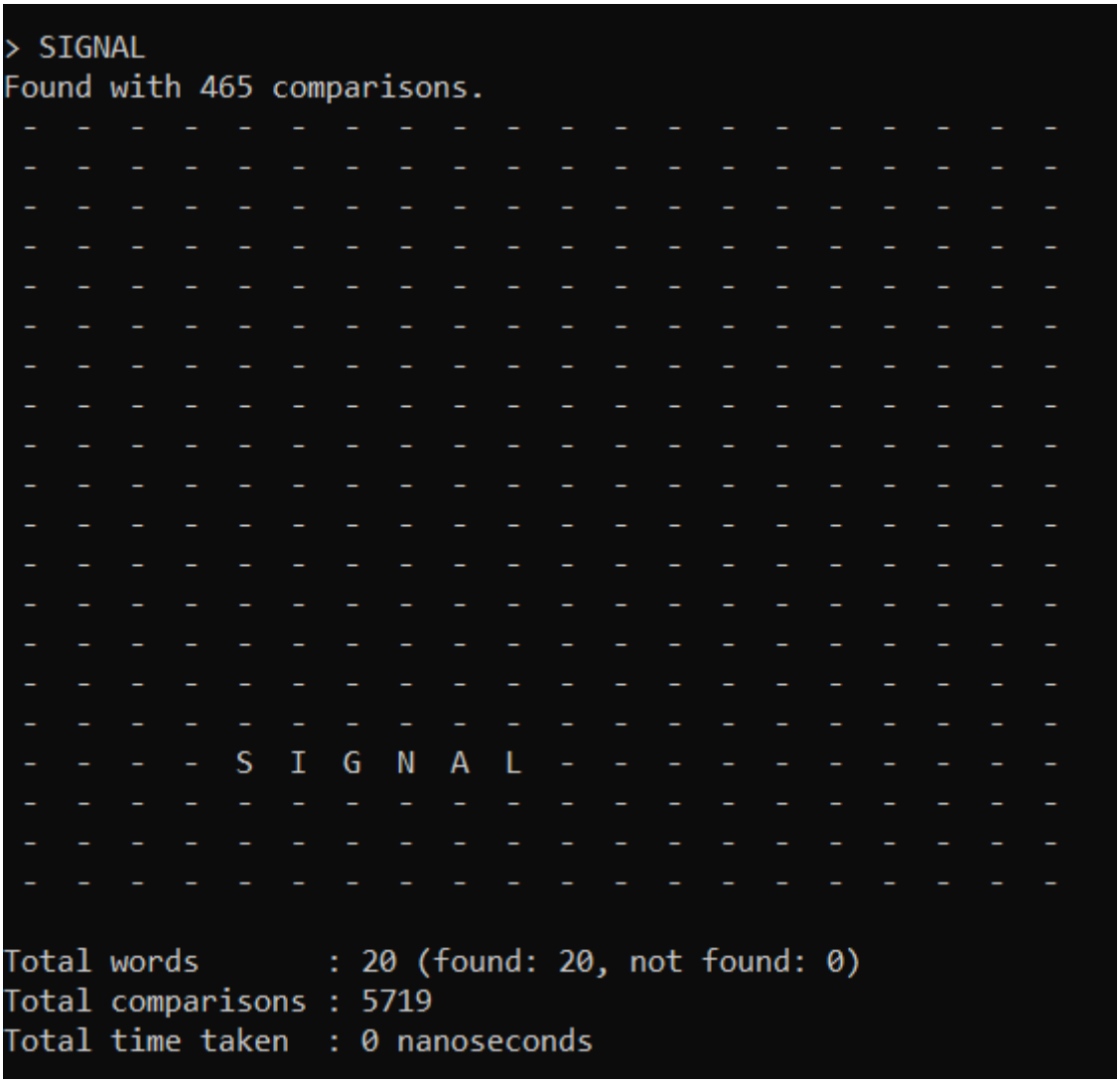

> ALCOHOLFREE
Found with 588 comparisons.
E
E
R
F
L
O
H
O
C
L
A
> HEARTSHAKER
Found with 290 comparisons.
R
E
K
A
H
S
T
R
A
E
H


> MOREANDMORE
Found with 340 comparisons.
M O R E A N D M O R E
> LIKEOOHAHH
Found with 21 comparisons.
L
I
K
E
O
O
H
A
H
H


> CANDYPOP
Found with 257 comparisons.
C
A
N
D
Y
P
O
P
> KNOCKKNOCK
Found with 26 comparisons.
K
N
O
C
K
K
N
O
C
K


> PERFECTWORLD
Found with 514 comparisons.
D L R O W T C E F R E P
> SCIENTIST
Found with 276 comparisons.
T
S
I
T
N
E
I
C
S

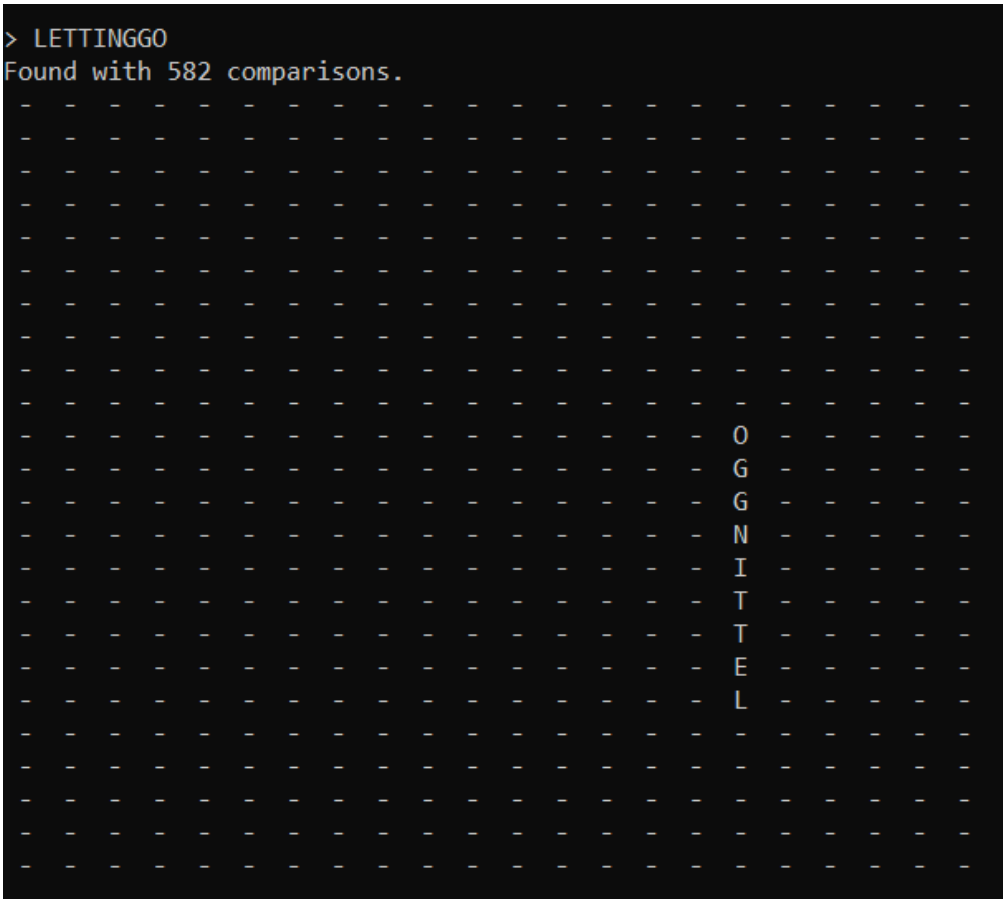

> DOUGHNUT
Found with 387 comparisons.
T
U
N
H
G
U
O
D
> BDZ
Found with 148 comparisons.
Z
D
B


> SIGNAL
Found with 465 comparisons.
S I G N A L
Total words : 20 (found: 20, not found: 0)
Total comparisons : 5719
Total time taken : 0 nanoseconds

F. md-3.txt

```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/md-3.txt
                          24 x 22 PUZZLE
 O   S   Q   X   H   Z   D   R   O   C   U   U   U   N   F   C   B   S   Z   W   M   Y
 D   X   N   P   L   J   B   P   V   L   W   B   O   P   R   B   O   L   W   O   U   B
 I   A   G   O   R   B   A   F   O   O   L   J   L   G   J   M   A   U   S   O   E   E
 N   G   L   N   I   A   E   H   X   S   Z   E   I   O   E   P   D   P   Y   F   F   N
 A   M   F   L   I   T   E   L   I   M   S   I   H   H   S   A   V   D   I   A   J   O
 C   C   J   V   A   N   A   T   N   U   H   L   O   I   N   D   E   L   Y   M   D   G
 T   W   H   H   W   L   R   L   Q   O   Z   W   V   C   H   V   R   K   T   T   J   S
 A   X   G   O   F   N   O   A   U   D   J   R   E   V   O   U   B   Y   I   U   R   Y
 H   R   S   N   K   C   E   N   W   T   O   D   Y   L   O   G   U   A   E   D   I   A
 W   J   F   R   I   K   S   X   E   G   A   B   I   F   Q   S   W   P   T   Y   D   D
 B   Q   A   S   R   L   F   N   W   N   Y   R   O   V   D   I   O   N   I   O   M   K
 T   T   Q   I   W   M   E   J   C   M   K   E   G   R   W   B   G   I   L   U   S   P
 U   M   K   G   A   B   E   E   G   F   M   R   J   N   D   C   G   M   I   M   H   V
 L   H   W   O   Z   A   K   F   F   I   O   G   O   E   O   B   N   S   K   A   O   W
 H   G   O   I   U   D   N   B   T   L   Z   Q   Q   B   Q   C   I   E   E   K   O   T
 Y   O   U   W   E   R   E   B   E   A   U   T   I   F   U   L   T   R   Y   E   T   C
 F   D   I   A   C   X   S   F   U   K   L   F   G   U   Q   V   T   I   O   M   M   X
 Y   H   A   E   K   A   X   V   Z   G   A   I   I   T   B   C   E   O   U   E   E   P
 Q   A   J   R   M   A   N   E   Q   O   H   Q   K   T   X   C   L   U   I   T   U   V
 K   H   M   Z   X   L   X   I   W   K   M   R   C   X   U   J   Y   S   M   O   X   B
 R   R   W   O   Q   S   U   H   S   Z   K   B   X   O   V   A   X   E   U   A   H   M
 Y   W   S   W   E   E   T   C   H   A   O   S   I   N   U   J   E   Y   D   C   N   V
 N   U   B   W   K   U   R   T   V   G   Y   X   L   E   L   N   R   B   O   U   G   E
 W   H   E   N   Y   O   U   L   O   V   E   S   O   M   E   O   N   E   H   A   R   W
```

```
> CONGRATULATIONS
Found with 406 comparisons.
 -   S   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   N   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   O   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   I   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   T   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   A   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   L   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   U   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   T   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   A   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   R   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   G   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   N   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   O   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   C   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
 -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -
```


> LETTINGGO
Found with 582 comparisons.
O
G
G
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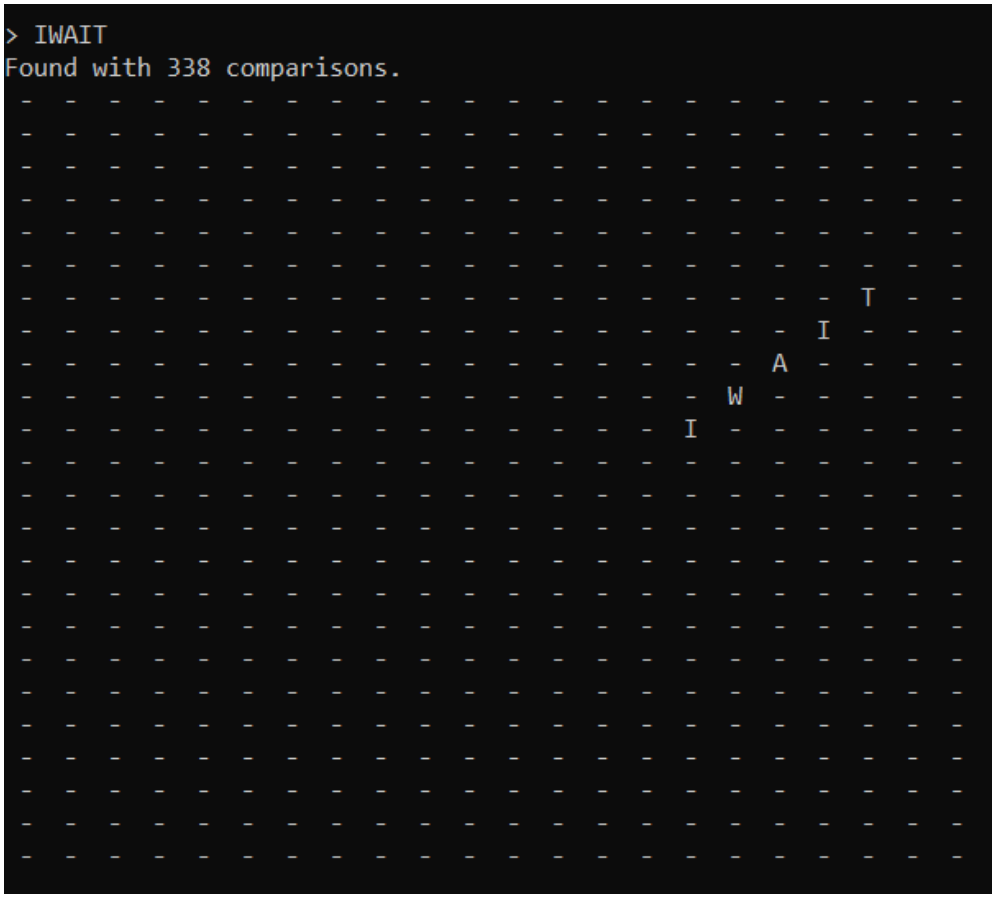
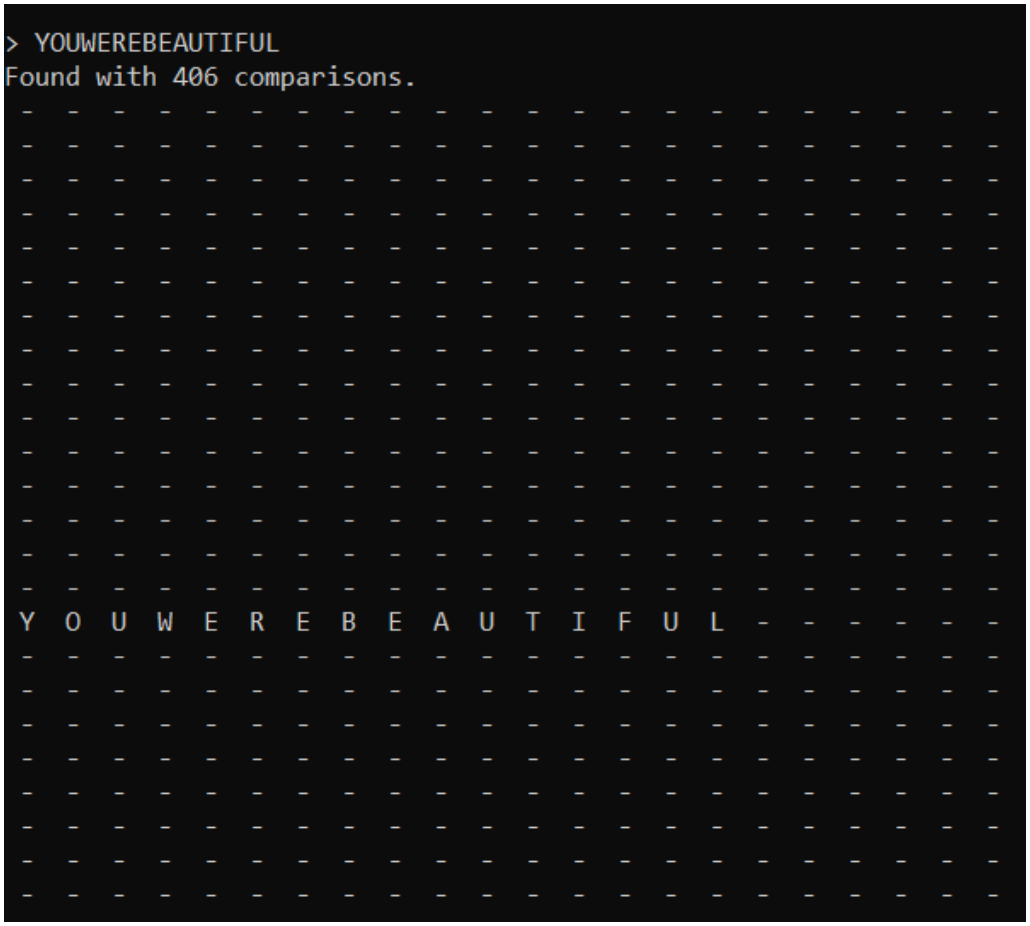
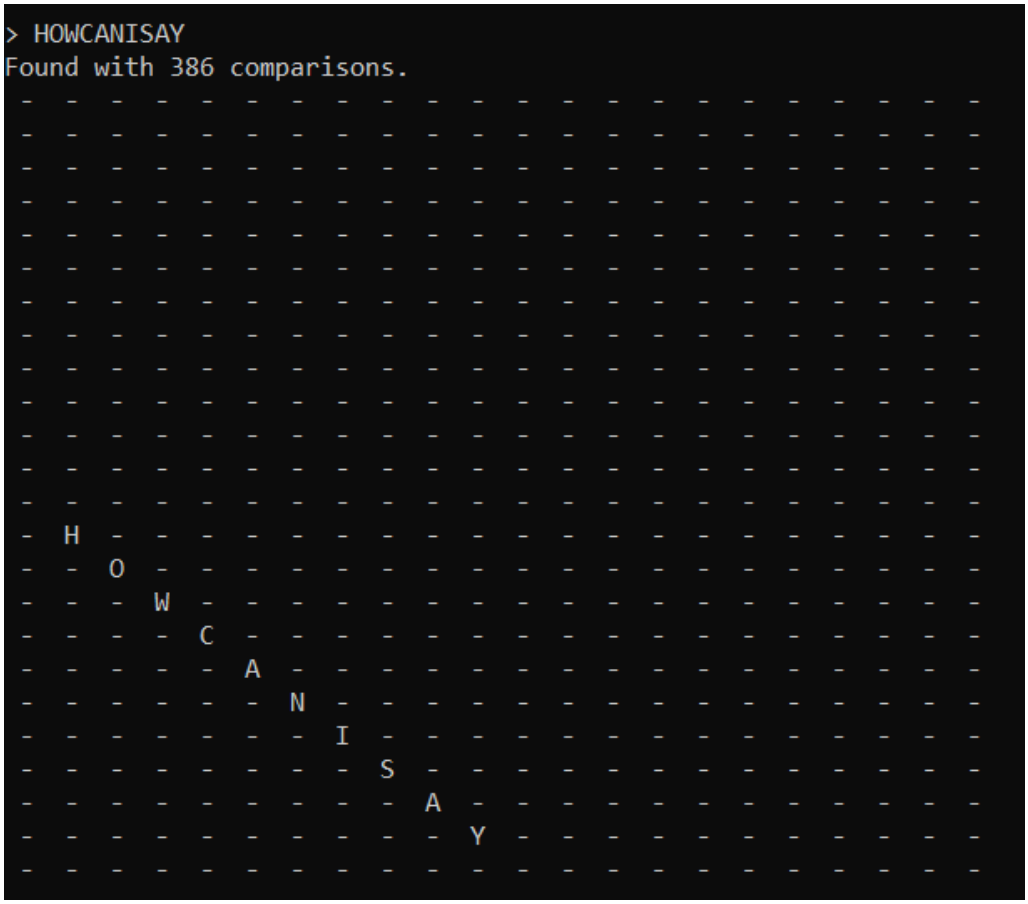
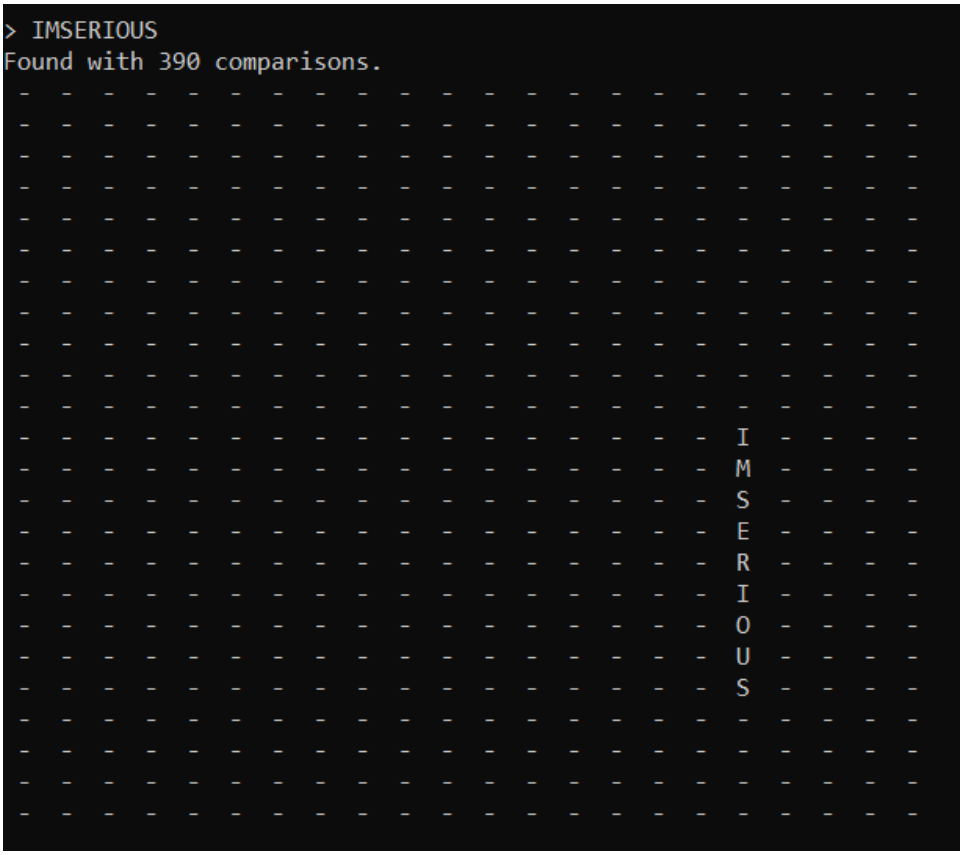
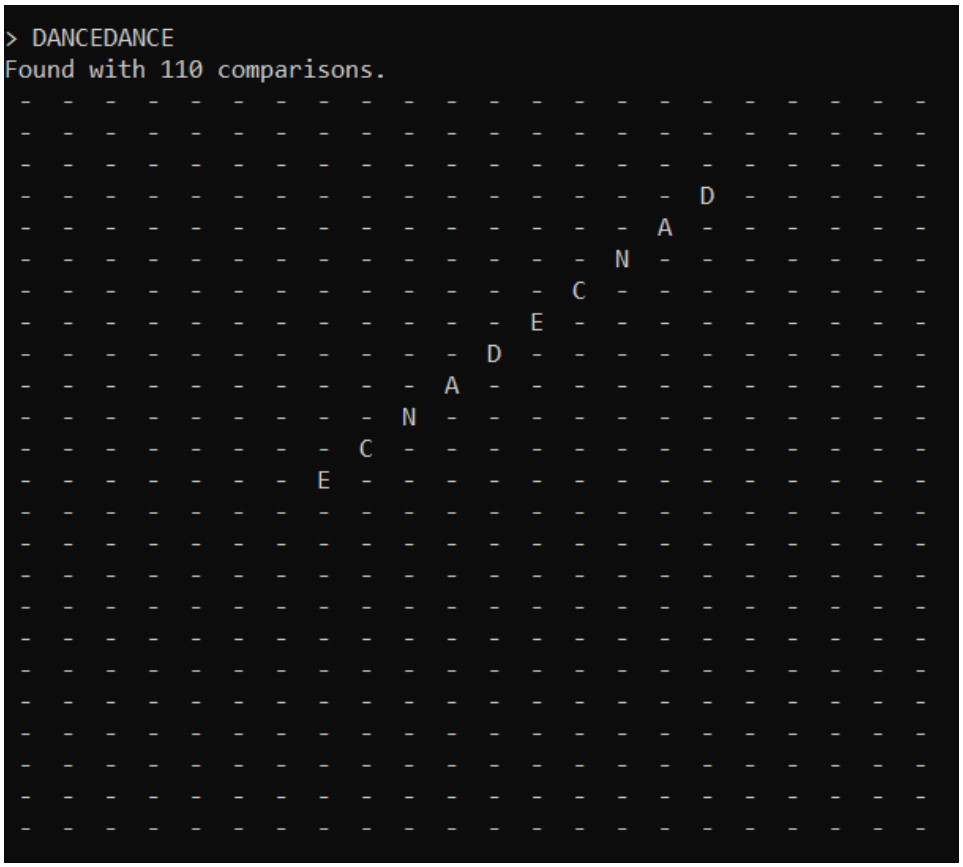
L

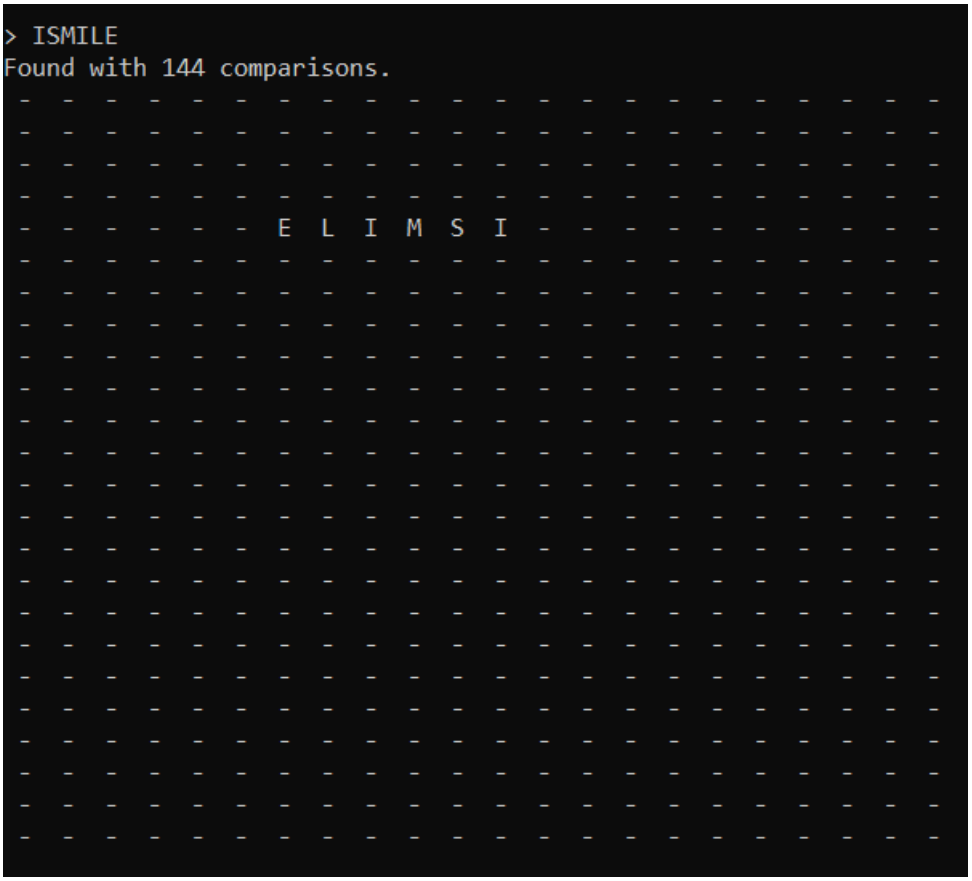

> IWAIT
Found with 338 comparisons.
T
I
A
W
I

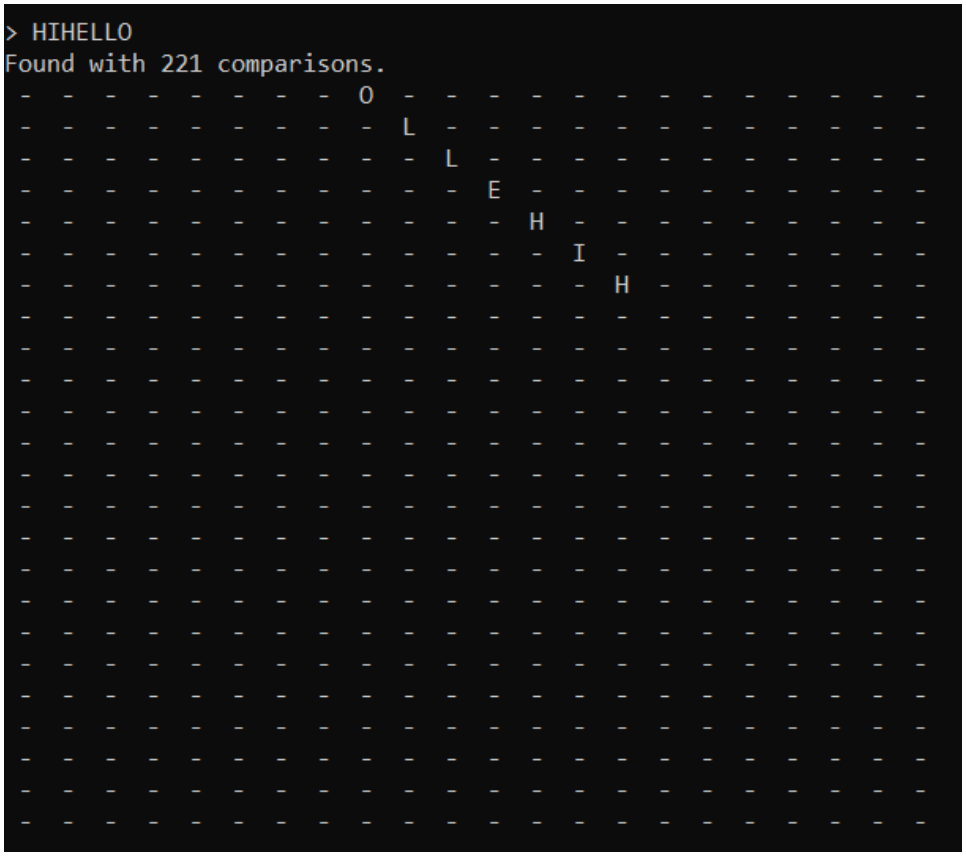

> YOUWEREBEAUTIFUL
Found with 406 comparisons.
Y O U W E R E B E A U T I F U L


> HOWCANISAY
Found with 386 comparisons.
H
O
W
C
A
N
I
S
A
Y


> IMSERIOUS
Found with 390 comparisons.
I
M
S
E
R
I
O
U
S


> DANCEDANCE
Found with 110 comparisons.
D
A
N
C
E
D
A
N
C
E


> ISMILE
Found with 144 comparisons.
E L I M S I


> HIHELLO
Found with 221 comparisons.
O
L
L
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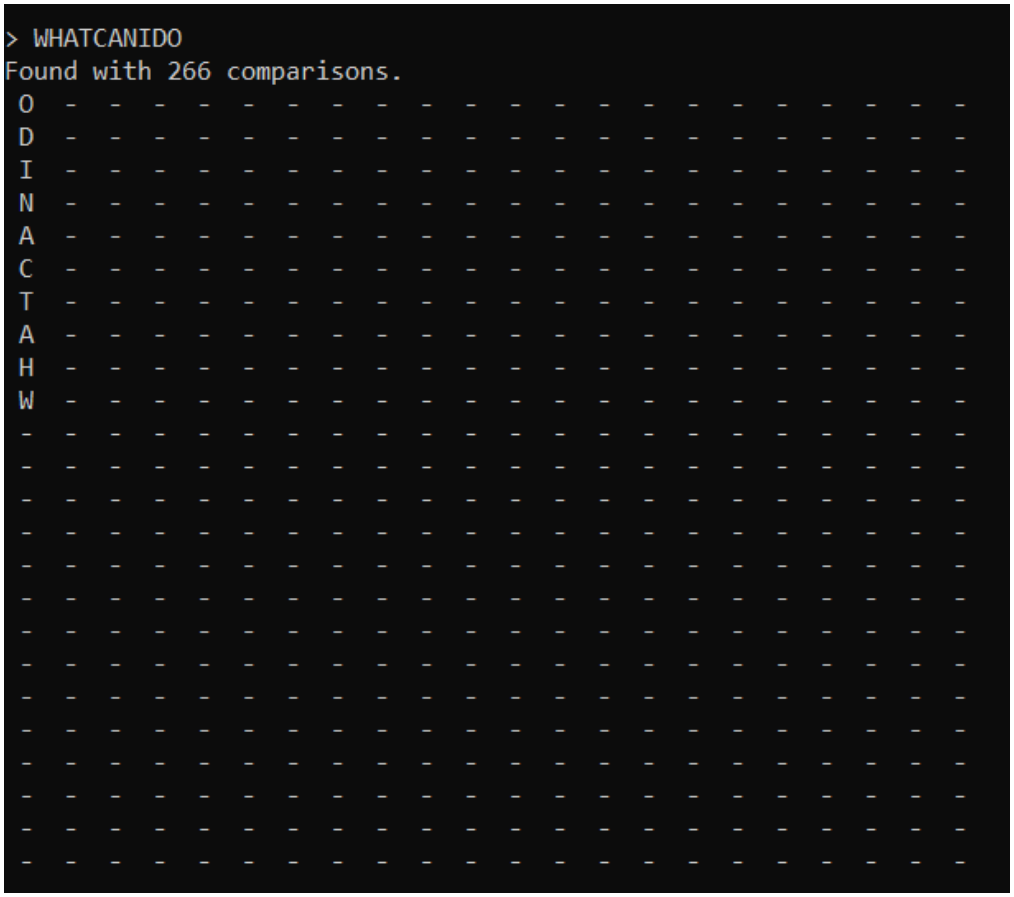
H


> WHATCANIDO
Found with 266 comparisons.
O
D
I
N
A
C
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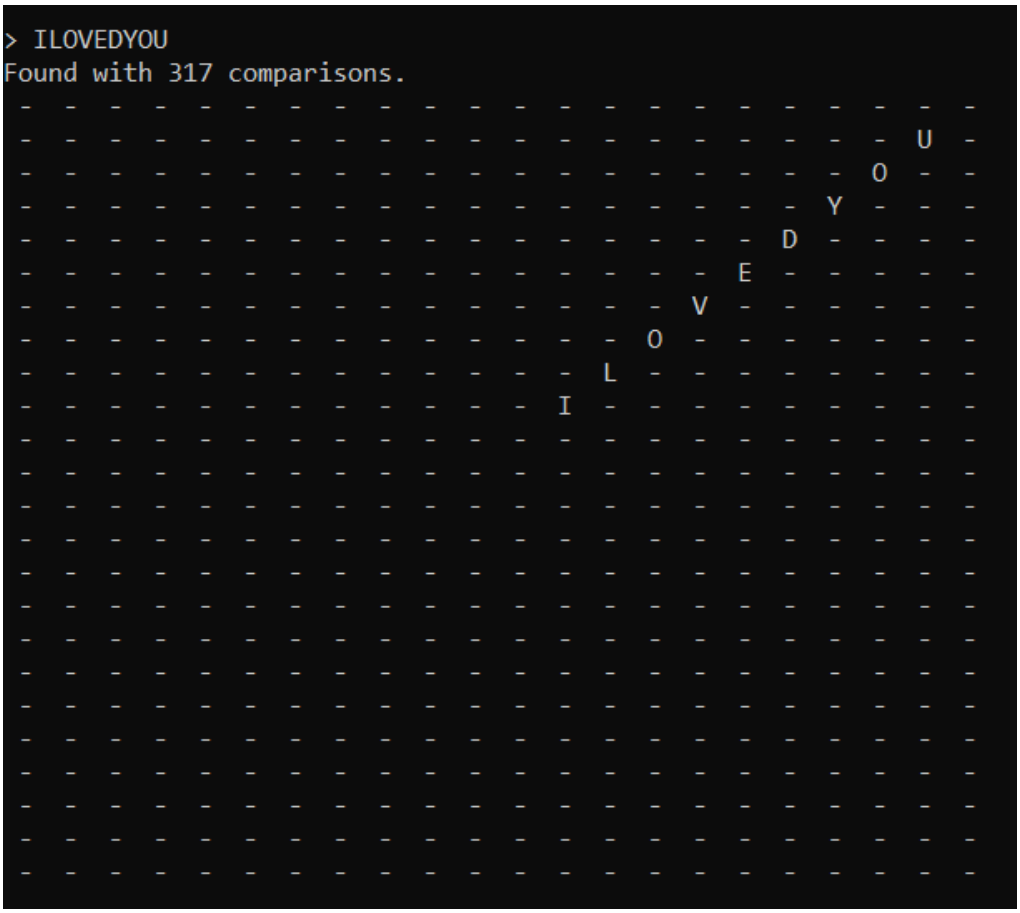
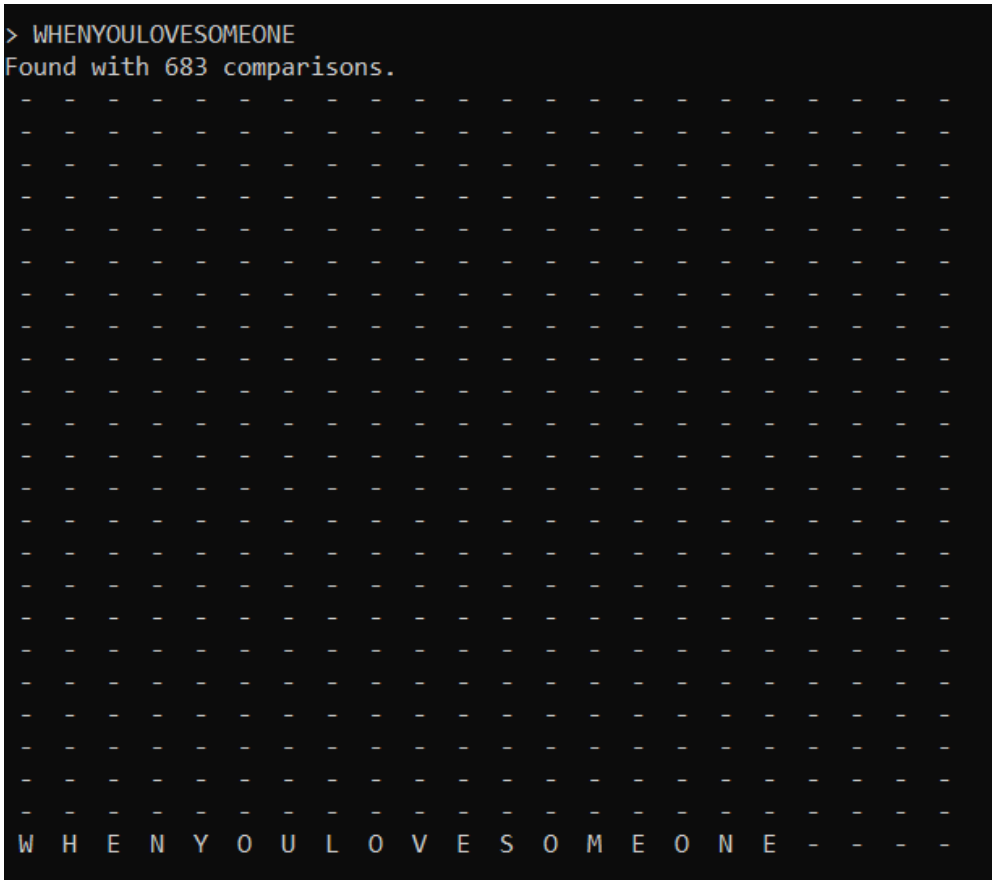
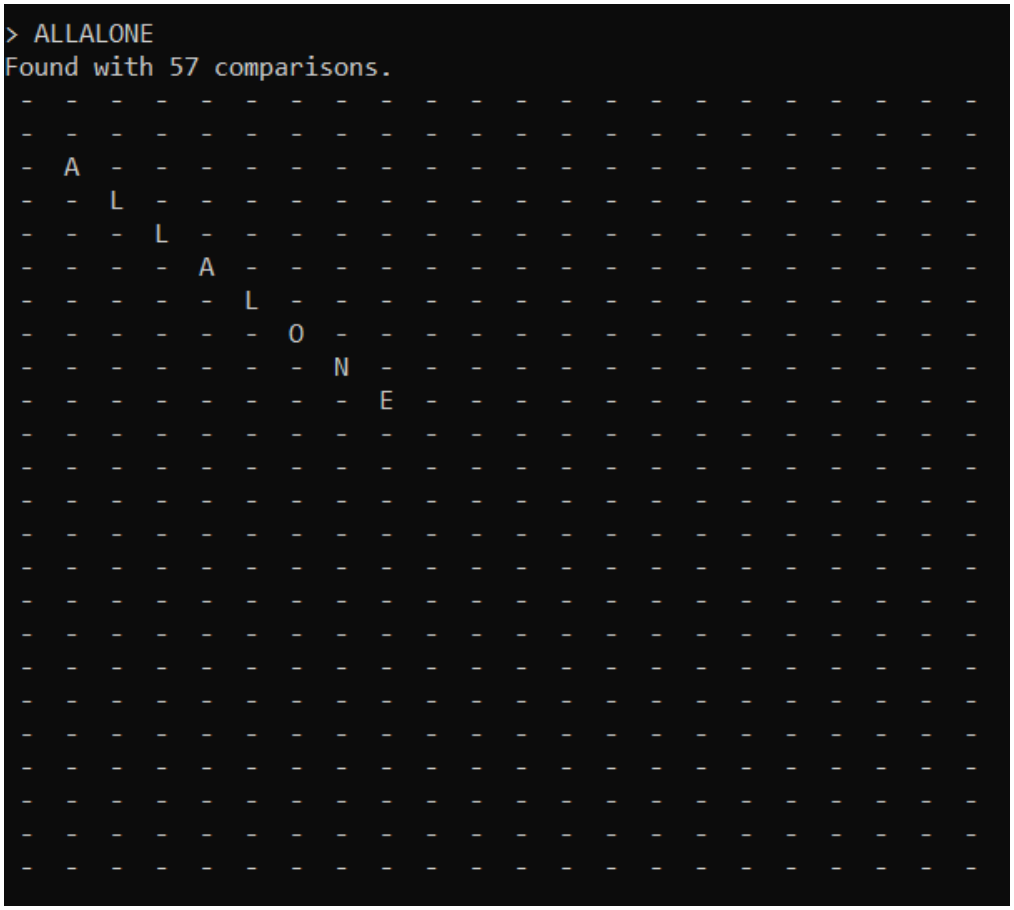
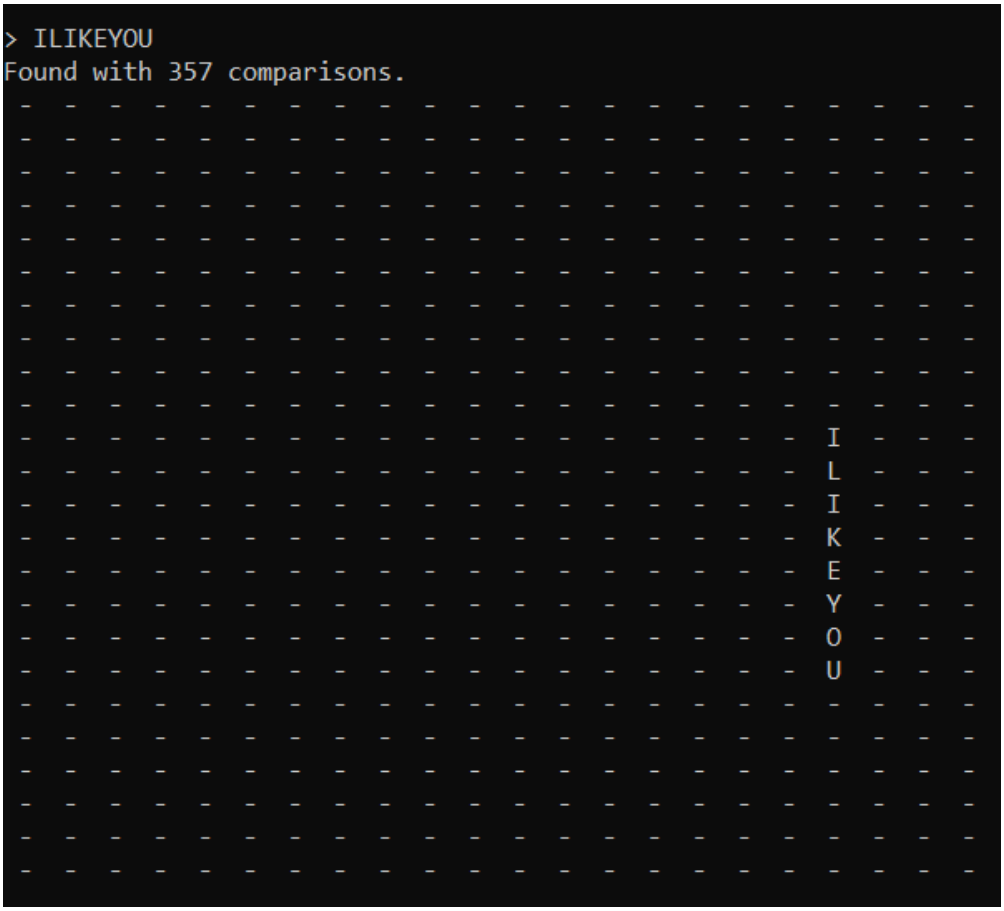
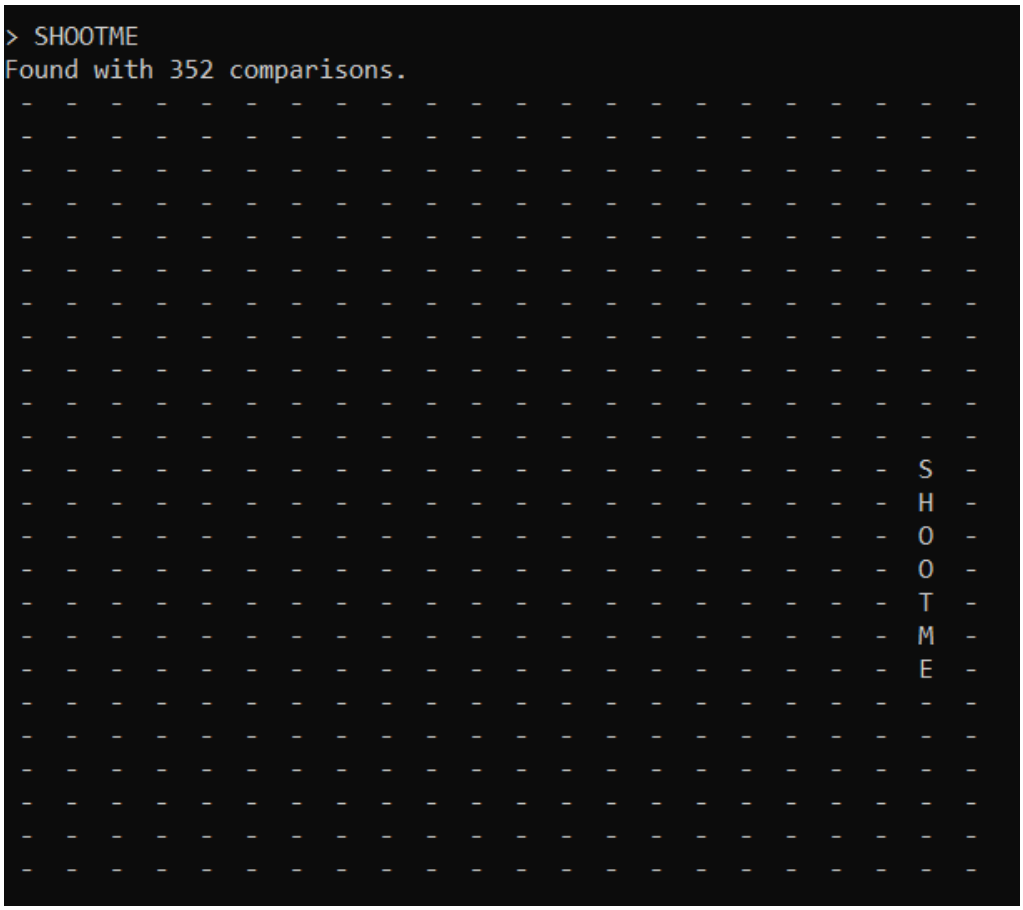
A
H
W

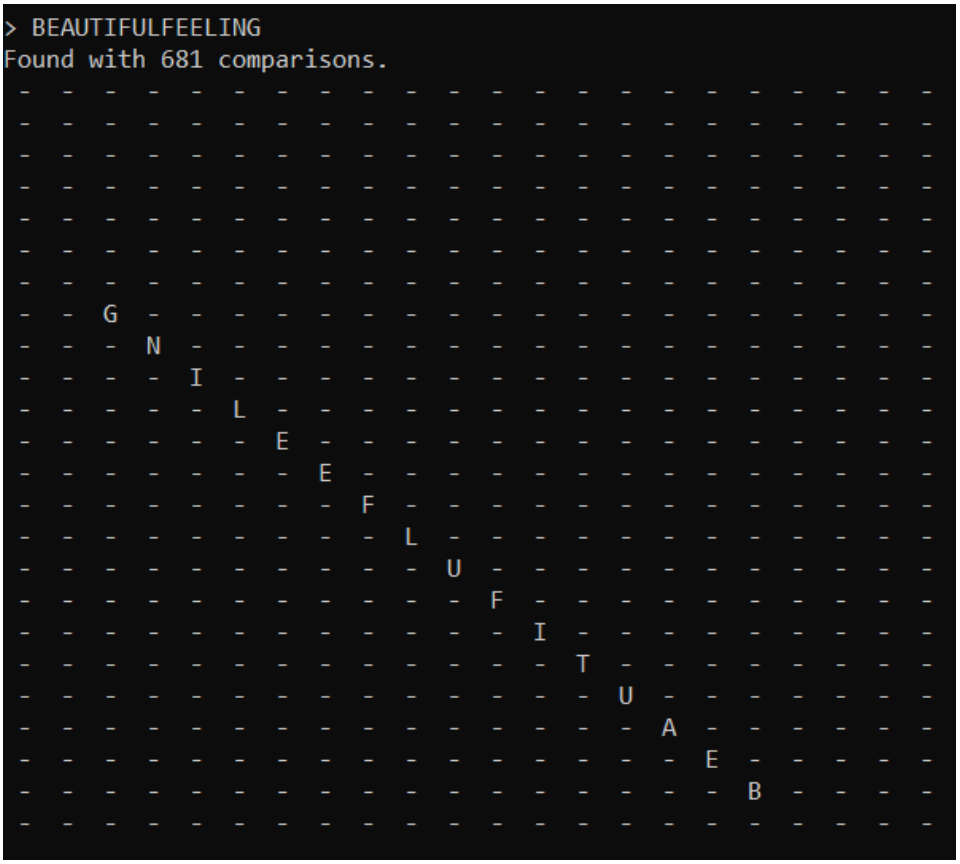

> ILOVEDYOU
Found with 317 comparisons.
U
O
Y
D
E
V
O
L
I

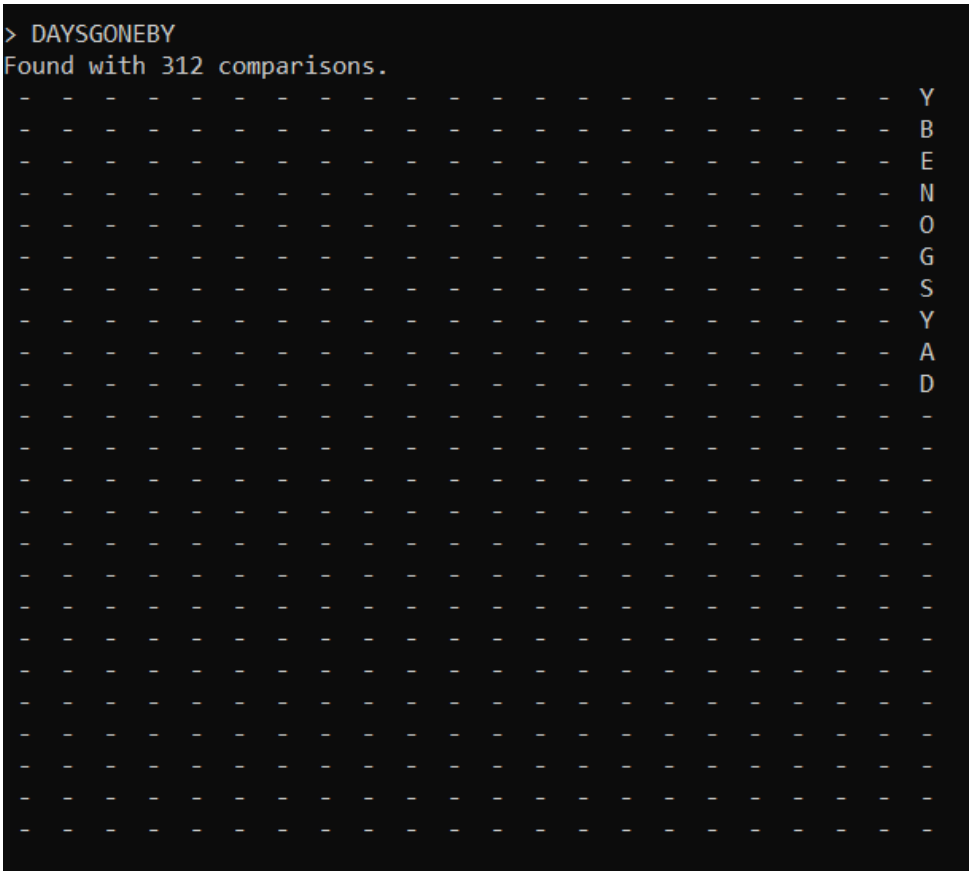

> WHENYOULOVESOMEONE
Found with 683 comparisons.
W H E N Y O U L O V E S O M E O N E

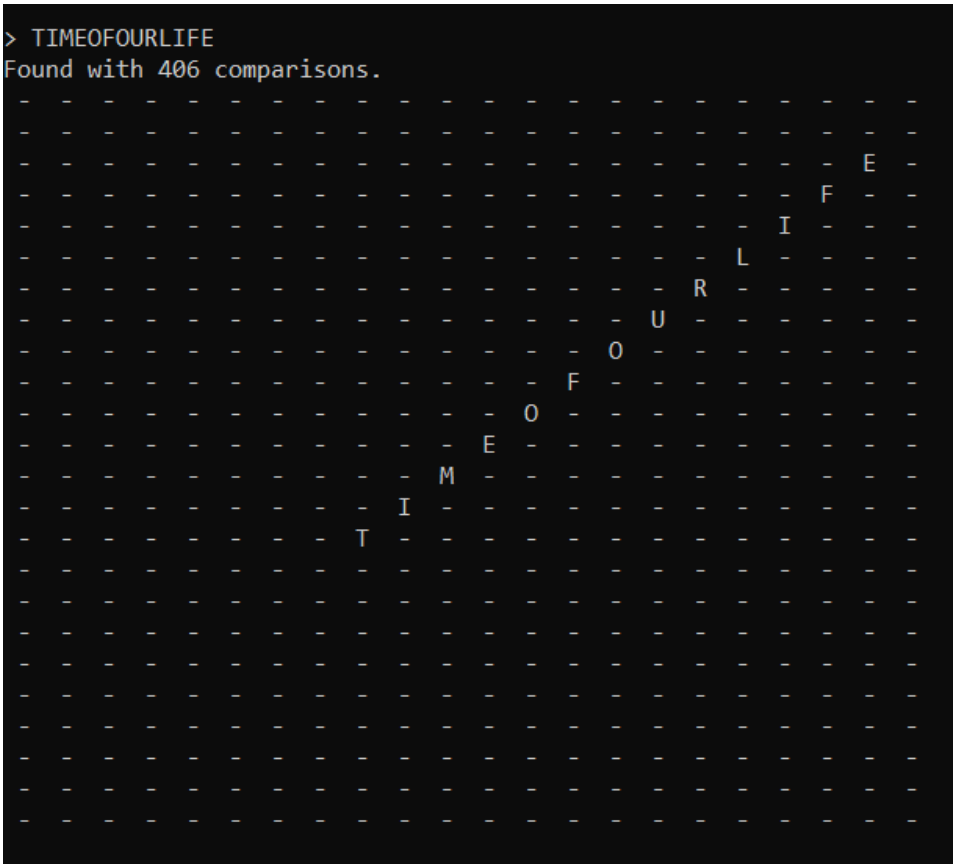

> ALLALONE
Found with 57 comparisons.

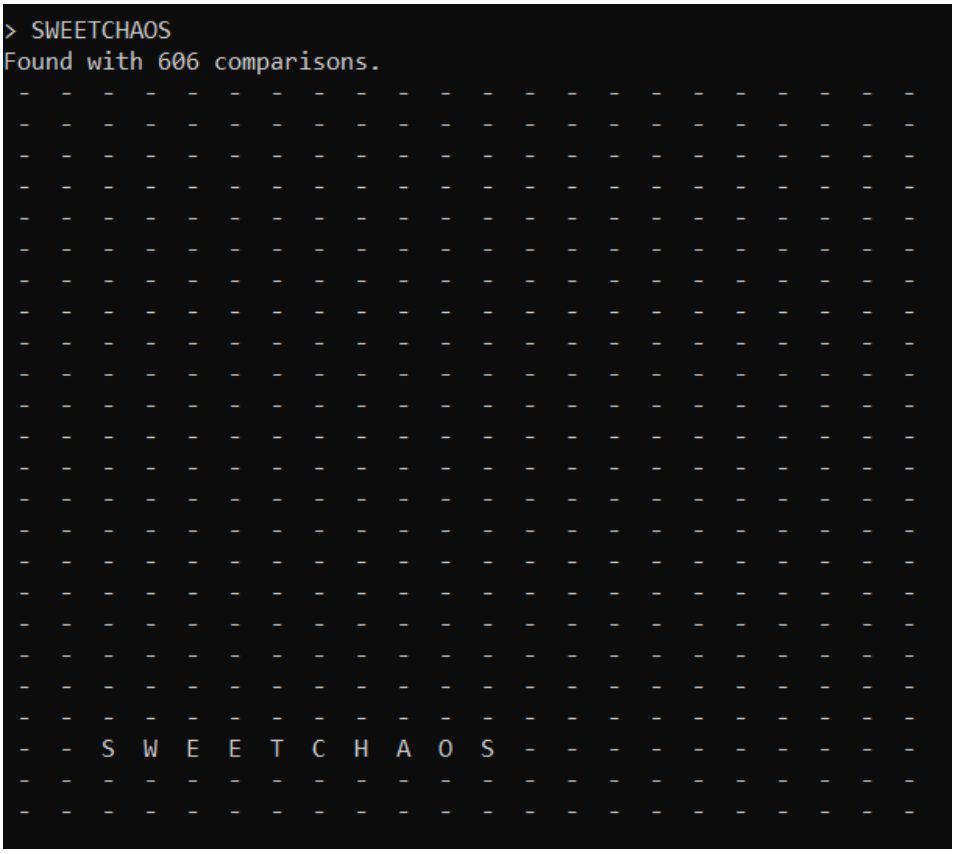

> ILIKEYOU
Found with 357 comparisons.
I
L
I
K
E
Y
O
U

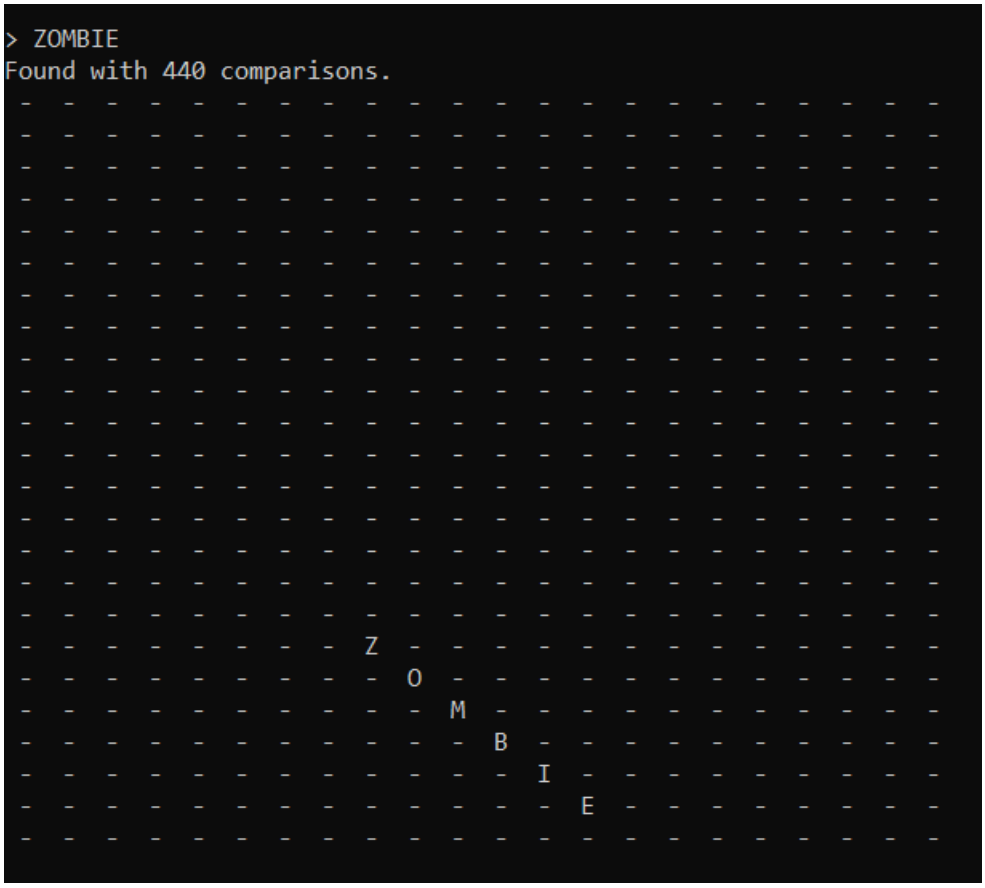

> SHOOTME
Found with 352 comparisons.
S
H
O
O
T
M
E

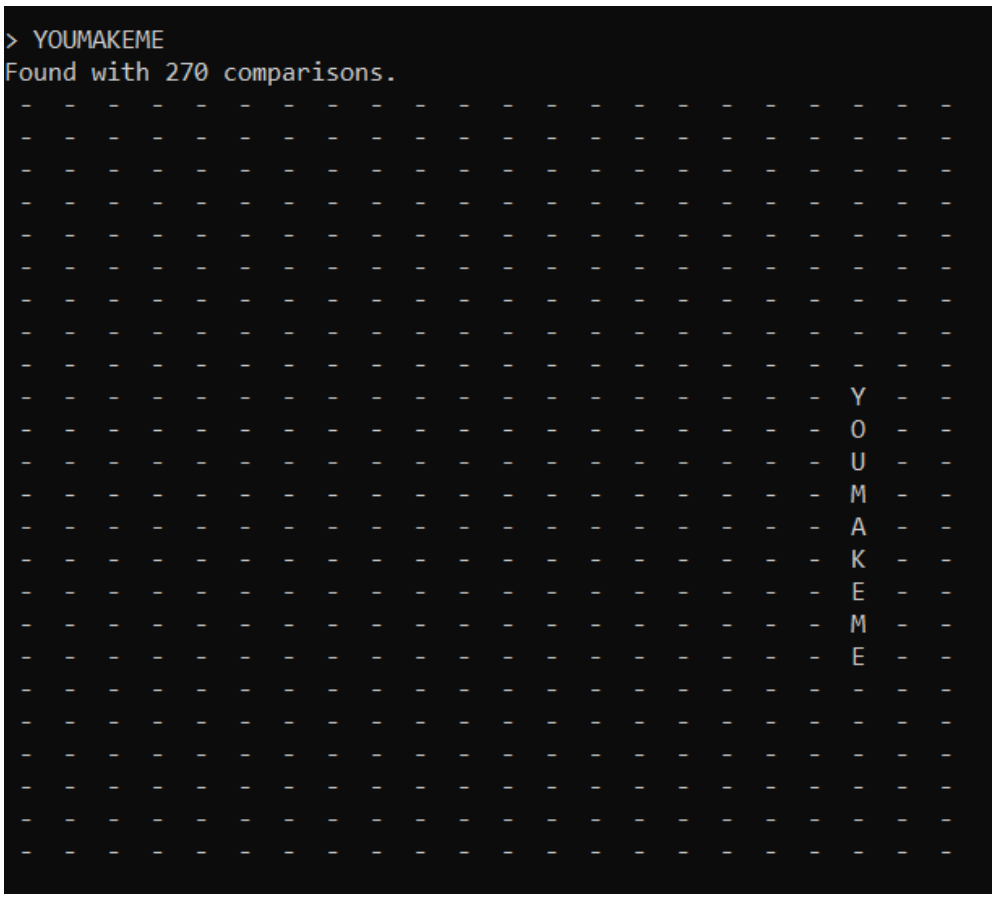

> BEAUTIFULFEELING
Found with 681 comparisons.

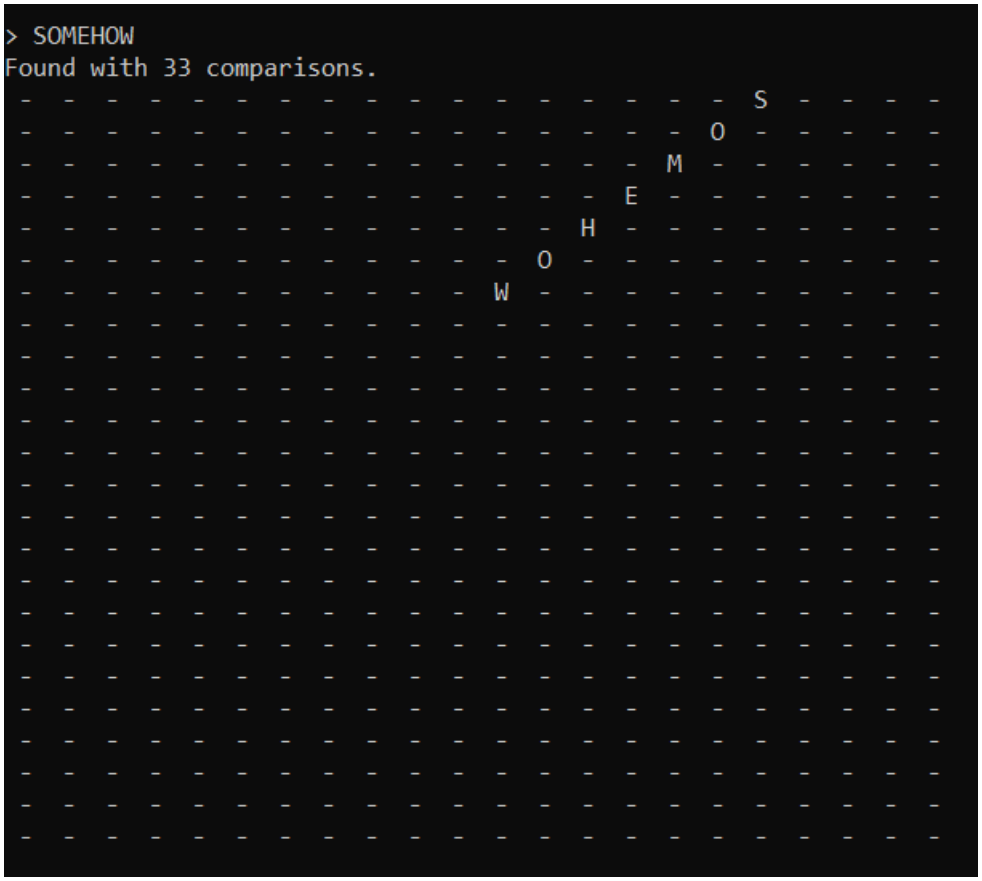

> DAYSGONEBY
Found with 312 comparisons.

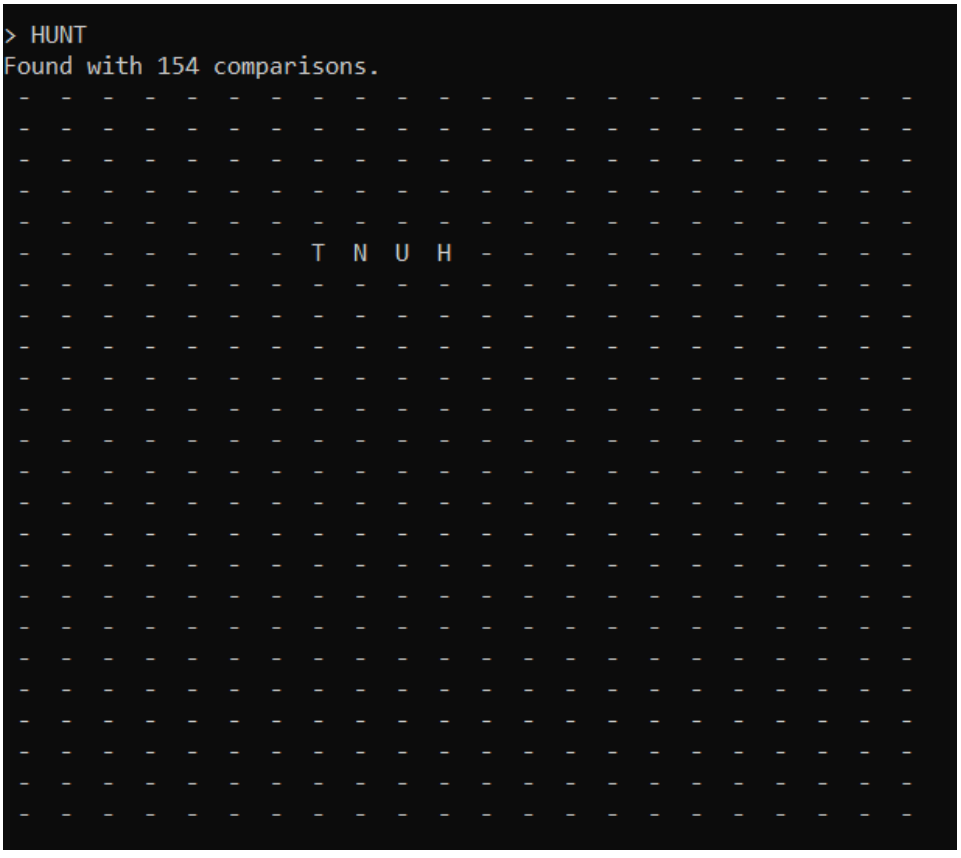

> TIMEOFOURLIFE
Found with 406 comparisons.

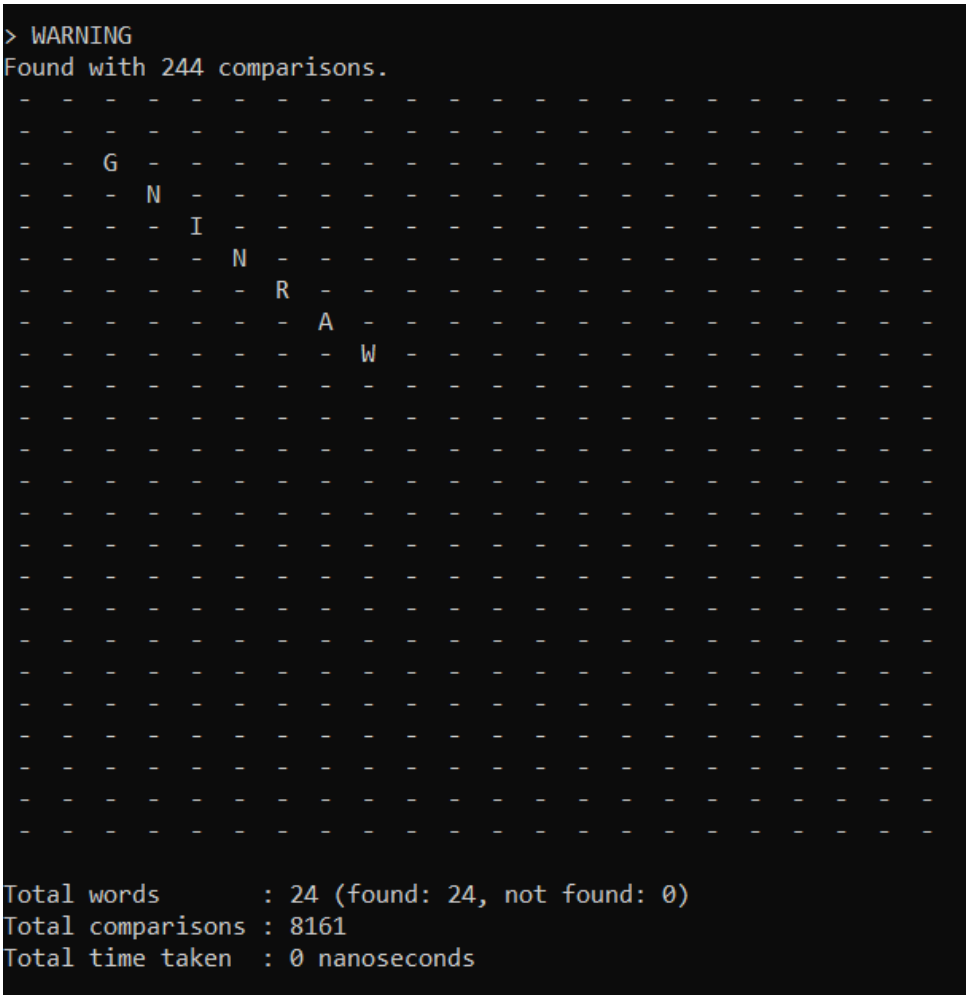

> SWEETCHAOS
Found with 606 comparisons.


> ZOMBIE
Found with 440 comparisons.

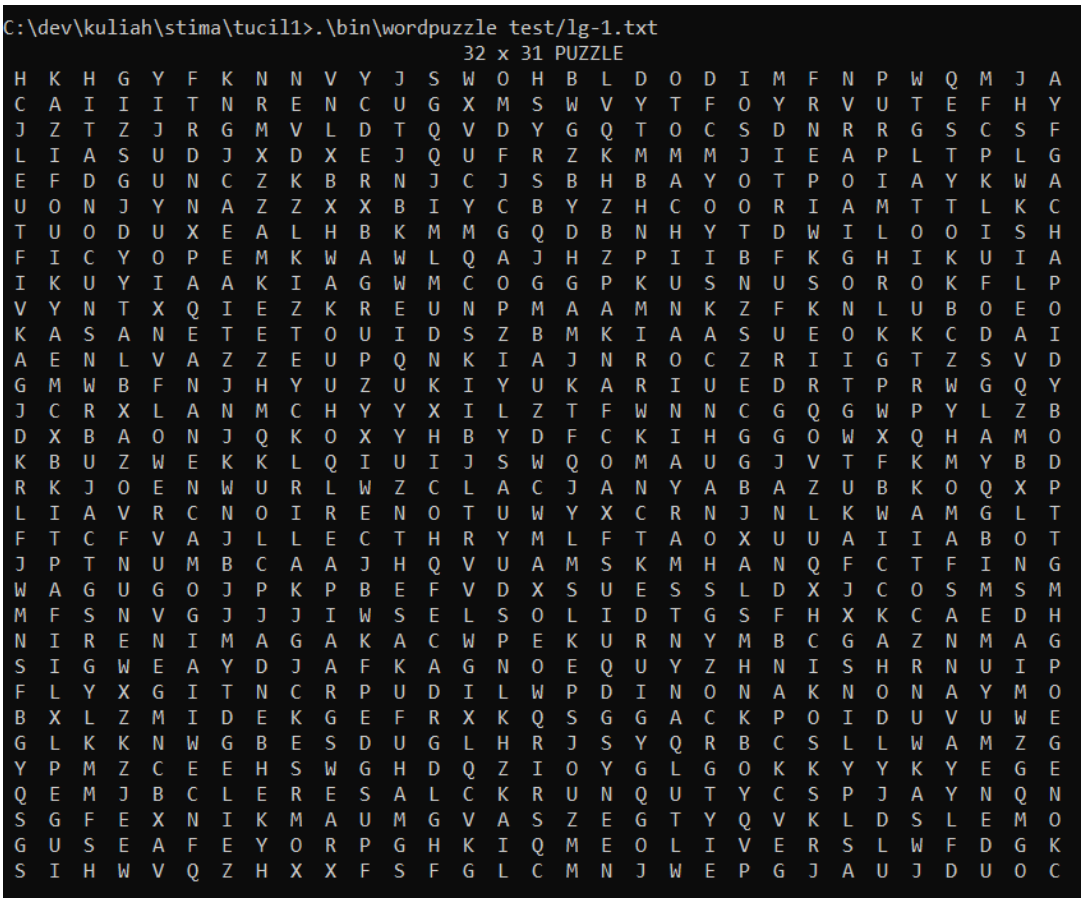

> YOUMAKEME
Found with 270 comparisons.

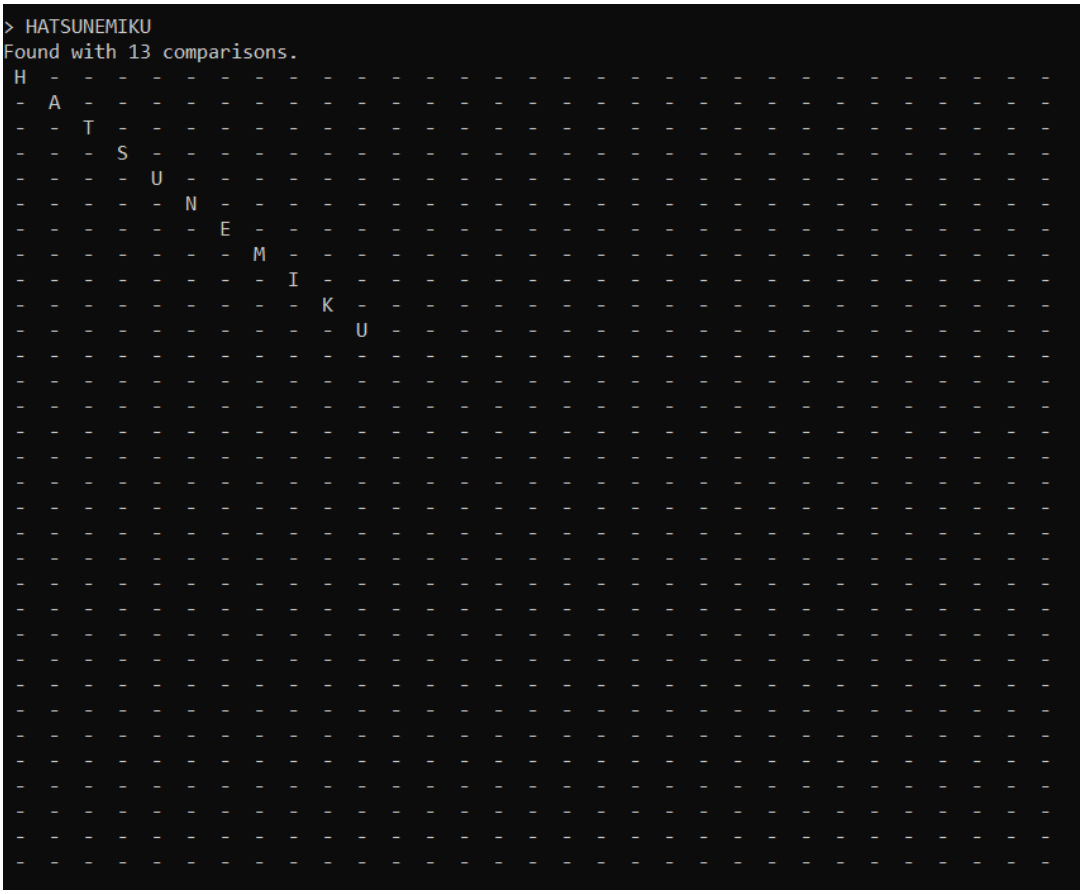

> SOMEHOW
Found with 33 comparisons.

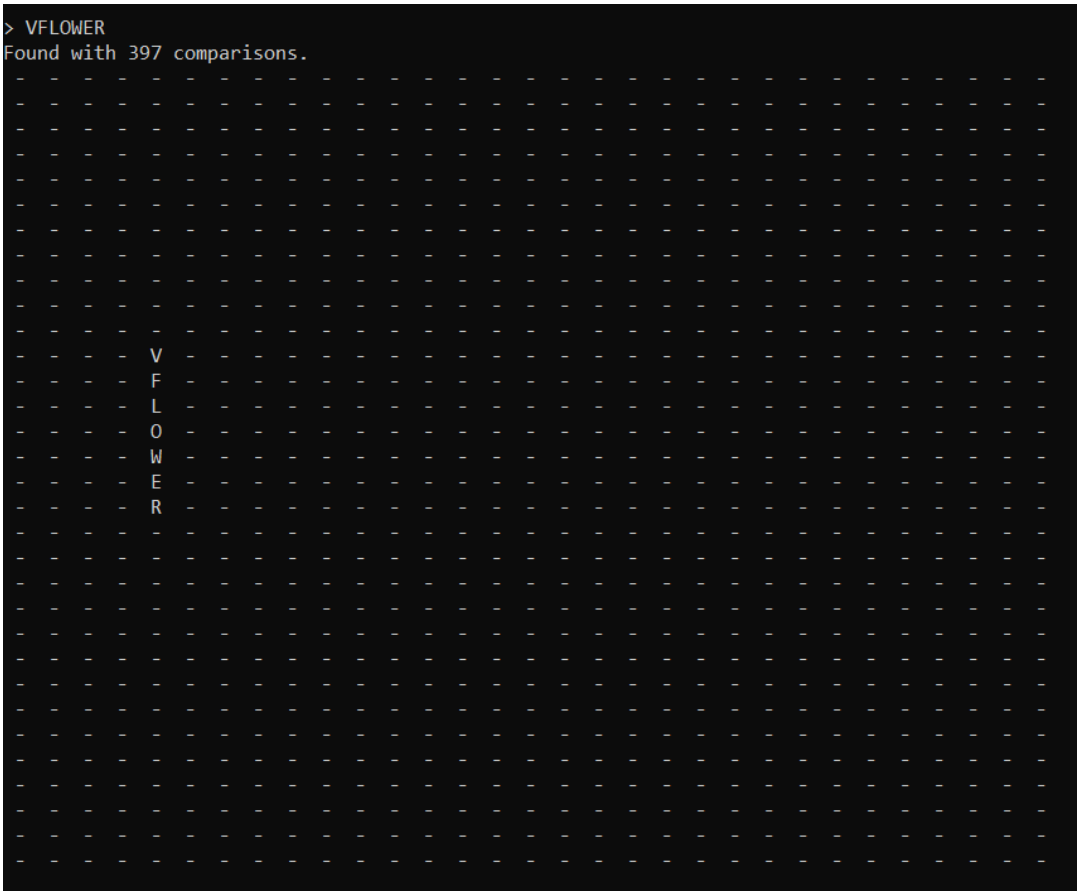

> HUNT
Found with 154 comparisons.

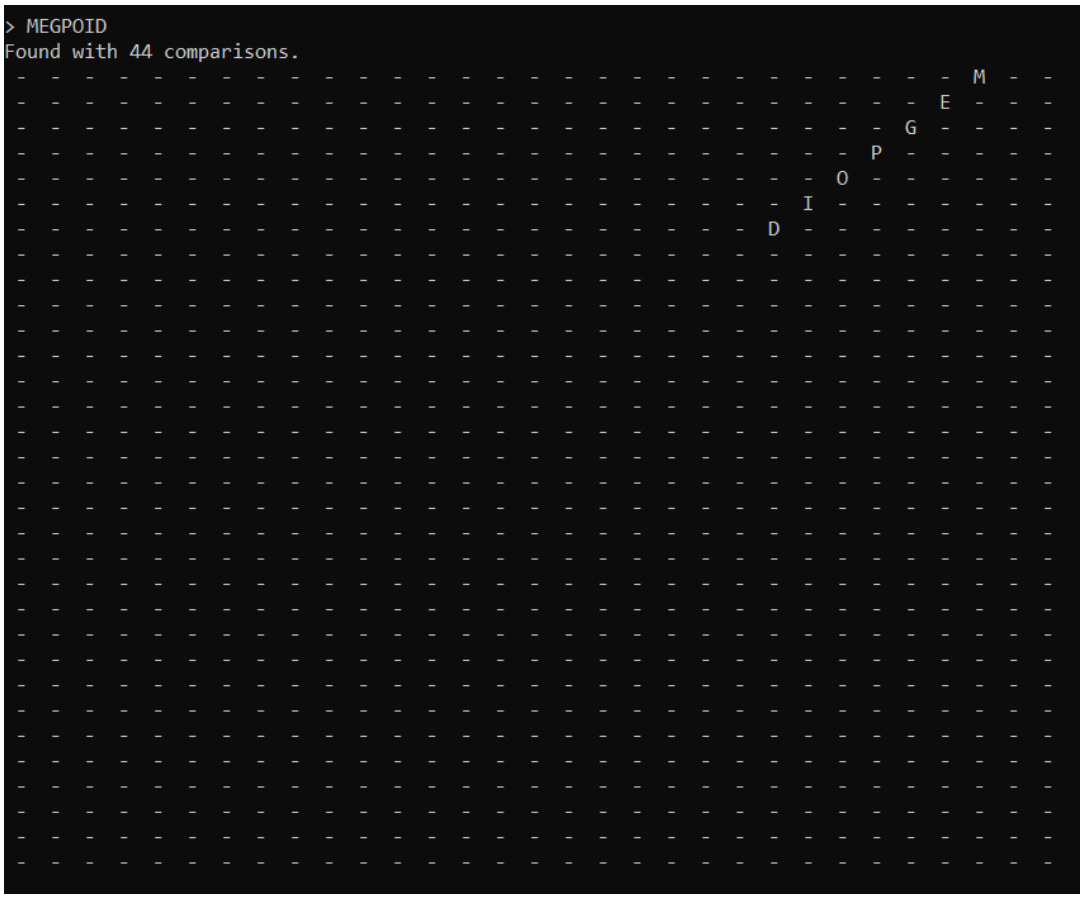

> WARNING
Found with 244 comparisons.
Total words : 24 (found: 24, not found: 0)
Total comparisons : 8161
Total time taken : 0 nanoseconds

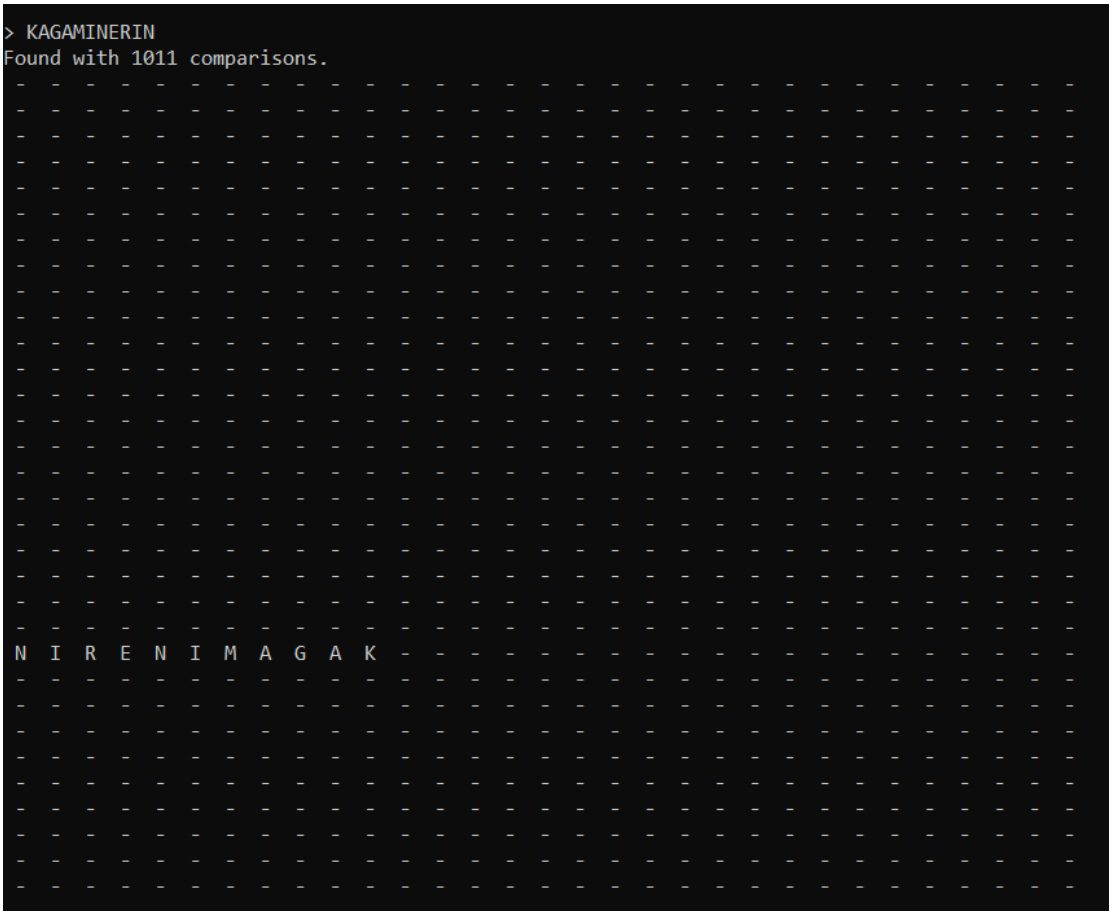
G. lg-1.txt

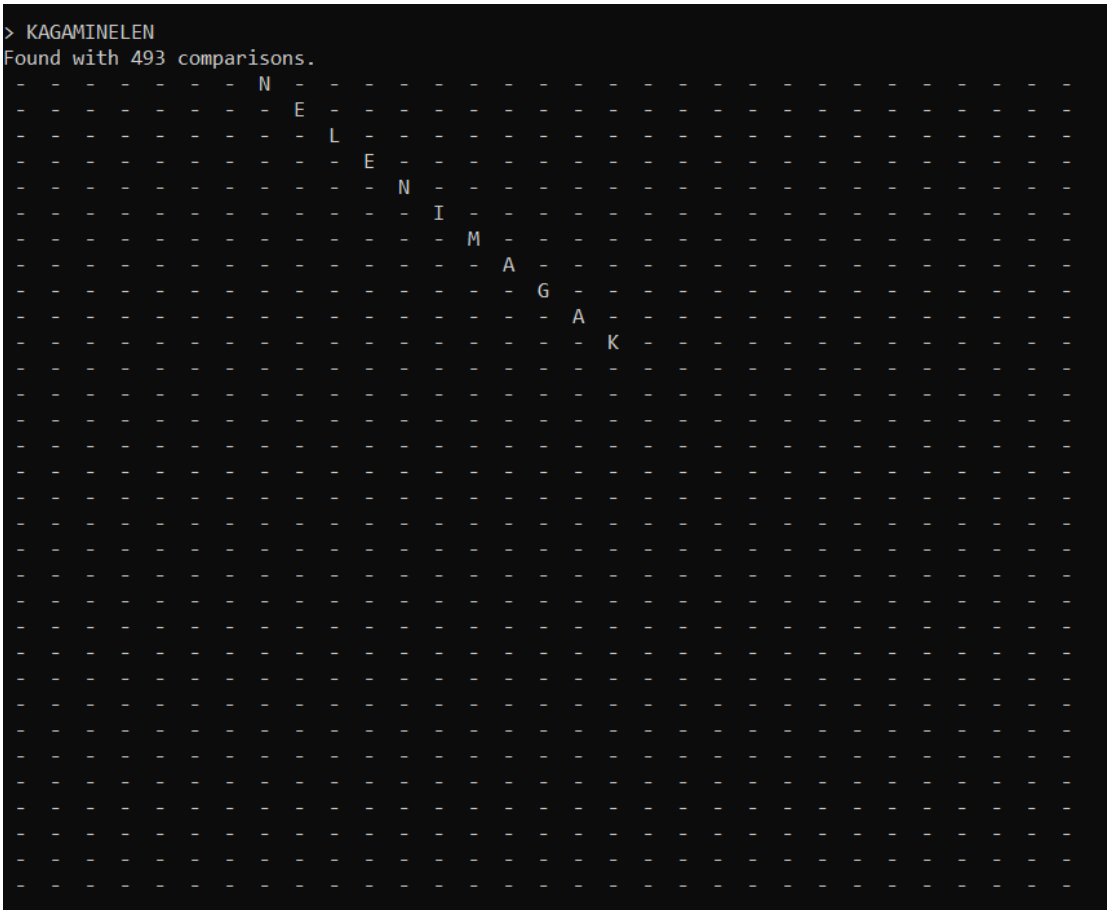

C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/lg-1.txt
32 x 31 PUZZLE
H K H G Y F K N N V Y J S W O H B L D O D I M F N P W Q M J A
C A I I I T N R E N C U G X M S W V Y T F O Y R V U T E F H Y
J Z T Z J R G M V L D T Q V D Y G Q T O C S D N R R G S C S F
L I A S U D J X D X E J Q U F R Z K M M M J I E A P L T P L G
E F D G U N C Z K B R N J C J S B H B A Y O T P O I A Y K W A
U O N J Y N A Z Z X X B I Y C B Y Z H C O O R I A M T T L K C
T U O D U X E A L H B K M M G Q D B N H Y T D W I L O O I S H
F I C Y O P E M K W A W L Q A J H Z P I I B F K G H I K U I A
I K U Y I A A K I A G W M C O G G P K U S N U S O R O K F L P
V Y N T X Q I E Z K R E U N P M A A M N K Z F K N L U B O E O
K A S A N E T E T O U I D S Z B M K I A A S U E O K K C D A I
A E N L V A Z Z E U P Q N K I A J N R O C Z R I I G T Z S V D
G M W B F N J H Y U Z U K I Y U K A R I U E D R T P R W G Q Y
J C R X L A N M C H Y Y X I L Z T F W N N C G Q G W P Y L Z B
D X B A O N J Q K O X Y H B Y D F C K I H G G O W X Q H A M O
K B U Z W E K K L Q I U I J S W Q O M A U G J V T F K M Y B D
R K J O E N W U R L W Z C L A C J A N Y A B A Z U B K O Q X P
L I A V R C N O I R E N O T U W Y X C R N J N L K W A M G L T
F T C F V A J L L E C T H R Y M L F T A O X U U A I I A B O T
J P T N U M B C A A J H Q V U A M S K M H A N Q F C T F I N G
W A G U G O J P K P B E F V D X S U E S S L D X J C O S M S M
M F S N V G J J J I W S E L S O L I D T G S F H X K C A E D H
N I R E N I M A G A K A C W P E K U R N Y M B C G A Z N M A G
S I G W E A Y D J A F K A G N O E Q U Y Z H N I S H R N U I P
F L Y X G I T N C R P U D I L W P D I N O N A K N O N A Y M O
B X L Z M I D E K G E F R X K Q S G G A C K P O I D U V U W E
G L K K N W G B E S D U G L H R J S Y Q R B C S L L W A M Z G
Y P M Z C E E H S W G H D Q Z I O Y G L G O K K Y Y K Y E G E
Q E M J B C L E R E S A L C K R U N Q U T Y C S P J A Y N Q N
S G F E X N I K M A U M G V A S Z E G T Y Q V K L D S L E M O
G U S E A F E Y O R P G H K I Q M E O L I V E R S L W F D G K
S I H W V Q Z H X X F S F G L C M N J W E P G J A U J D U O C

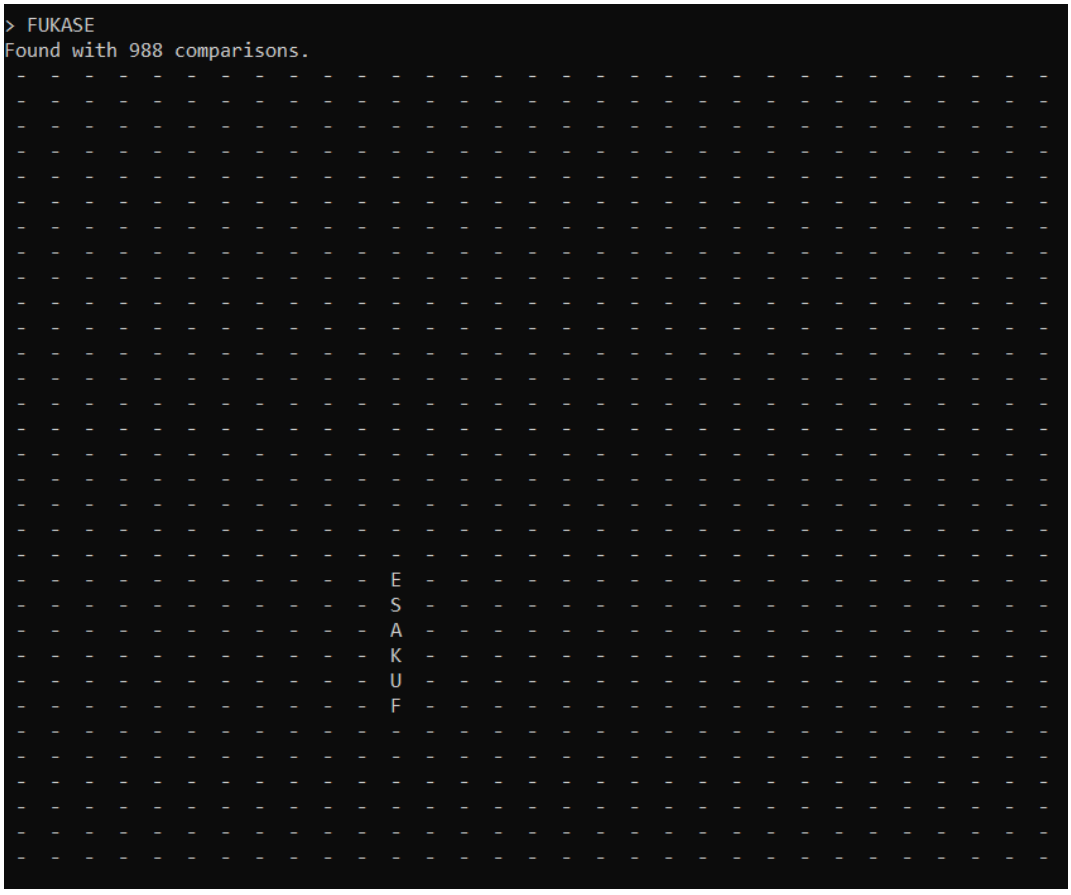

> HATSUNEMIKU
Found with 13 comparisons.

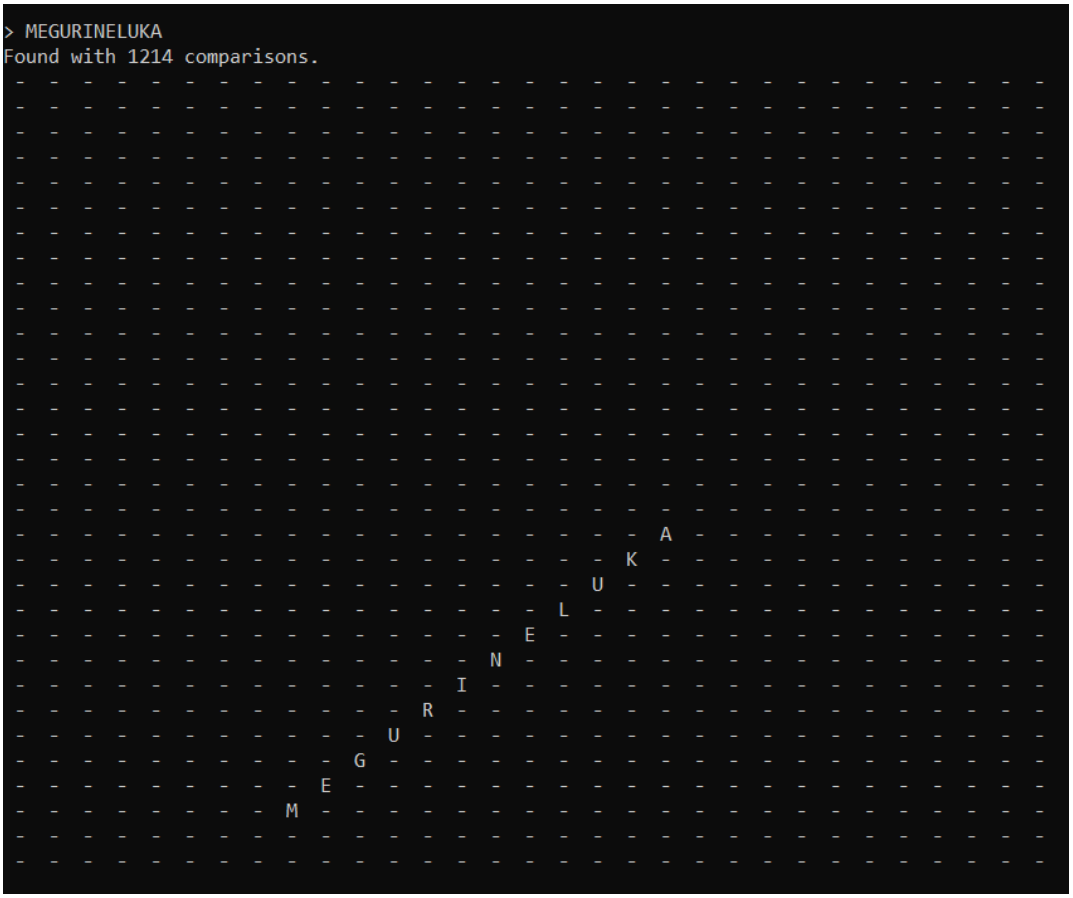

> VFLOWER
Found with 397 comparisons.
V
F
L
O
W
E
R

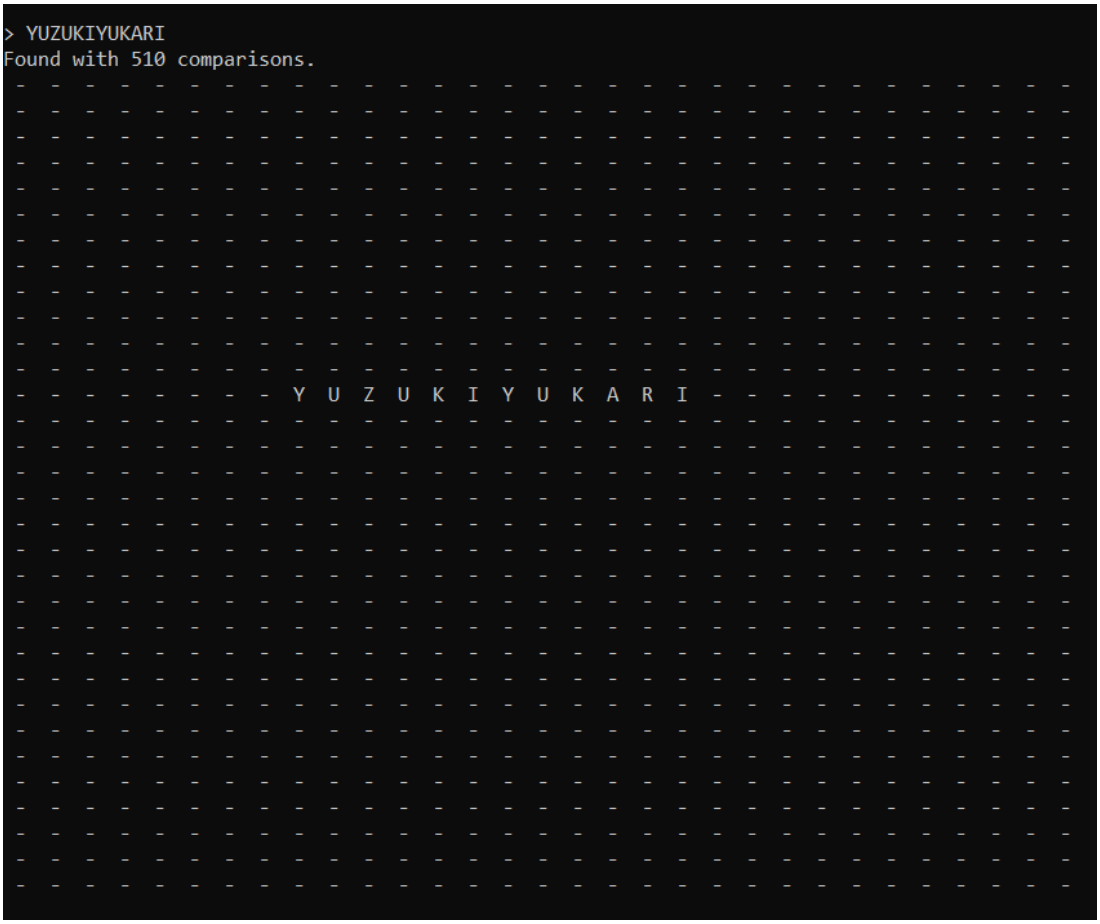

> MEGPOID
Found with 44 comparisons.
M
E
G
P
O
I
D

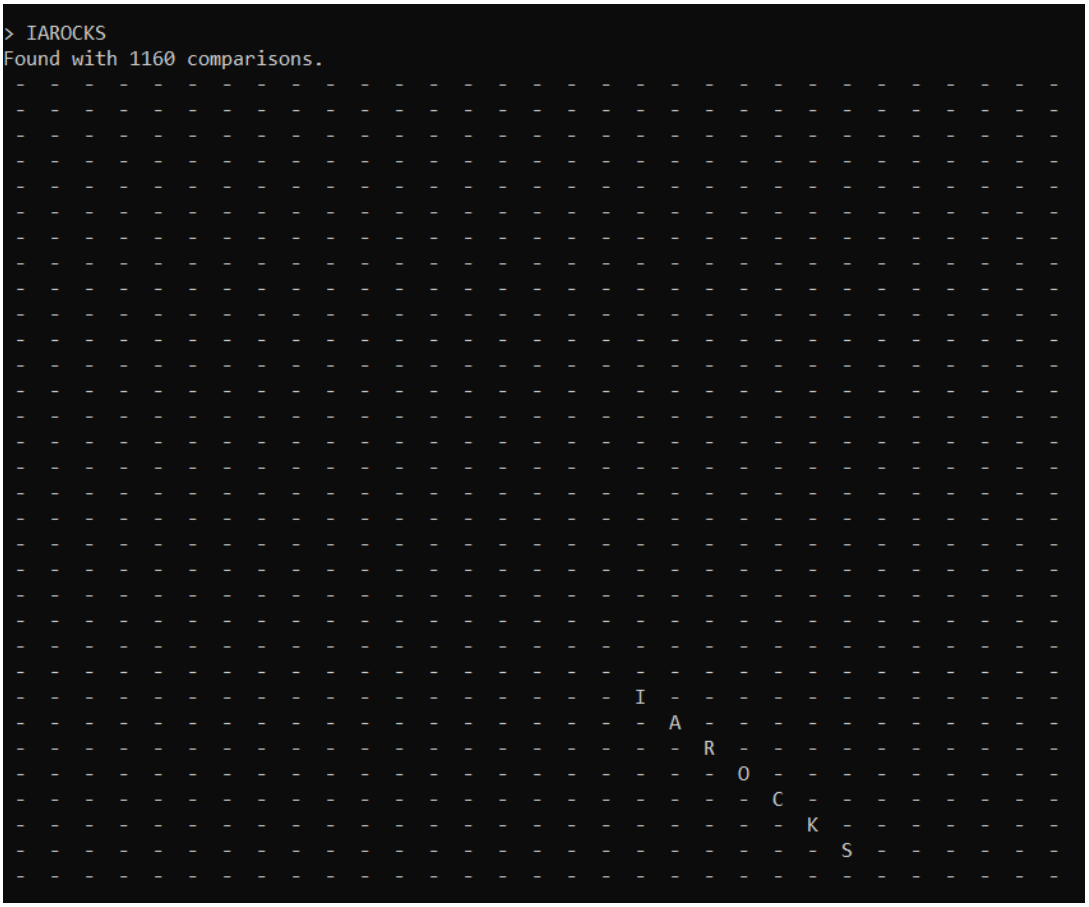

> KAGAMINERIN
Found with 1011 comparisons.
N I R E N I M A G A K

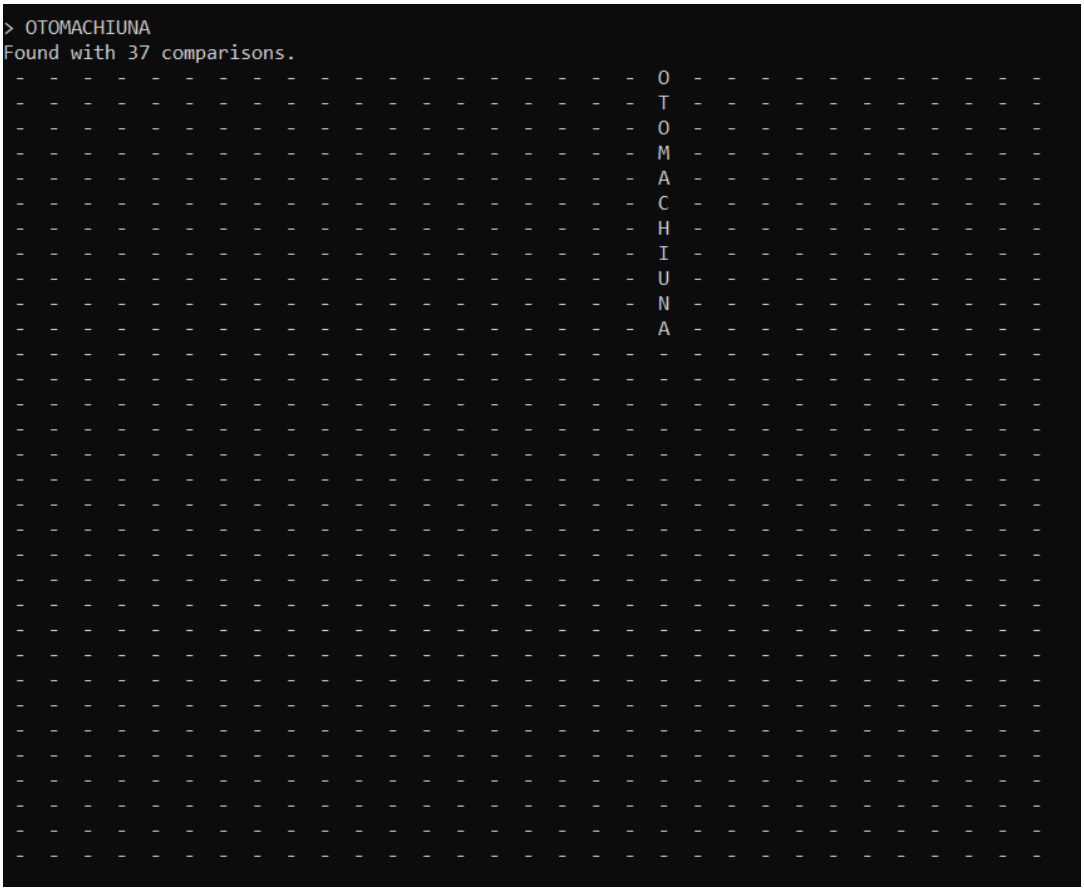

> KAGAMINELEN
Found with 493 comparisons.
N
E
L
E
N
I
M
A
G
A
K


> FUKASE
Found with 988 comparisons.
E
S
A
K
U
F

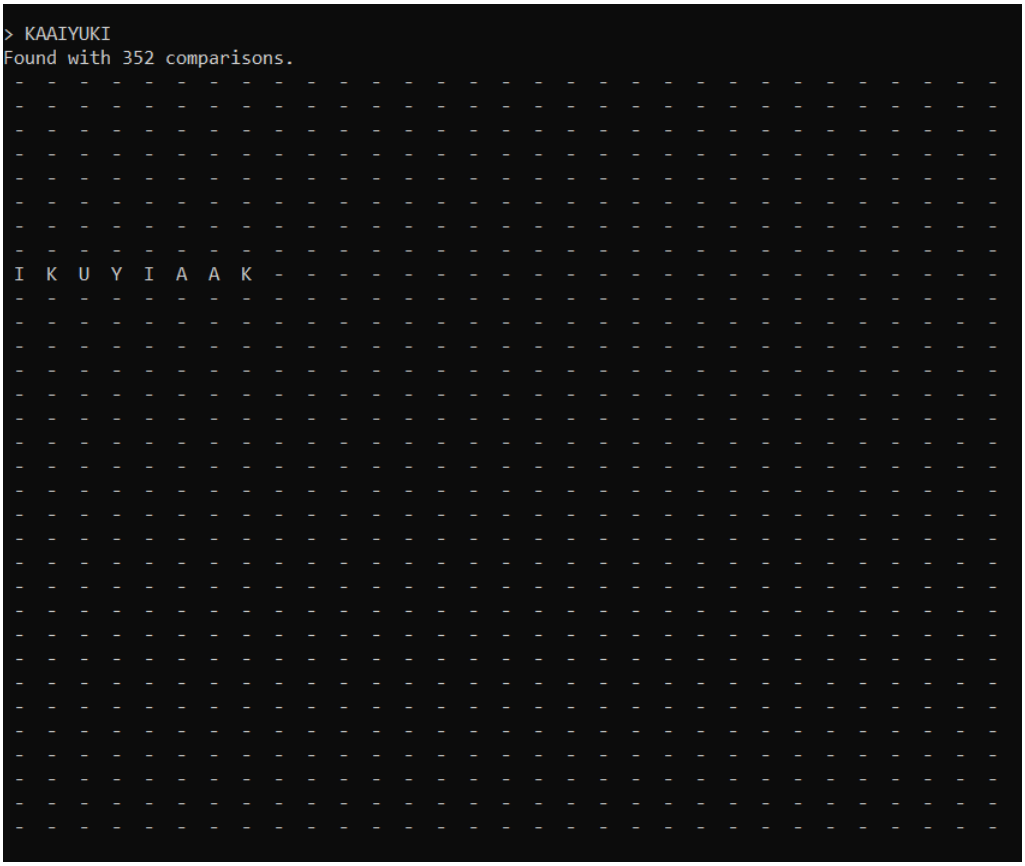

> MEGURINELUKA
Found with 1214 comparisons.
A
K
U
L
E
N
I
R
U
G
E
M

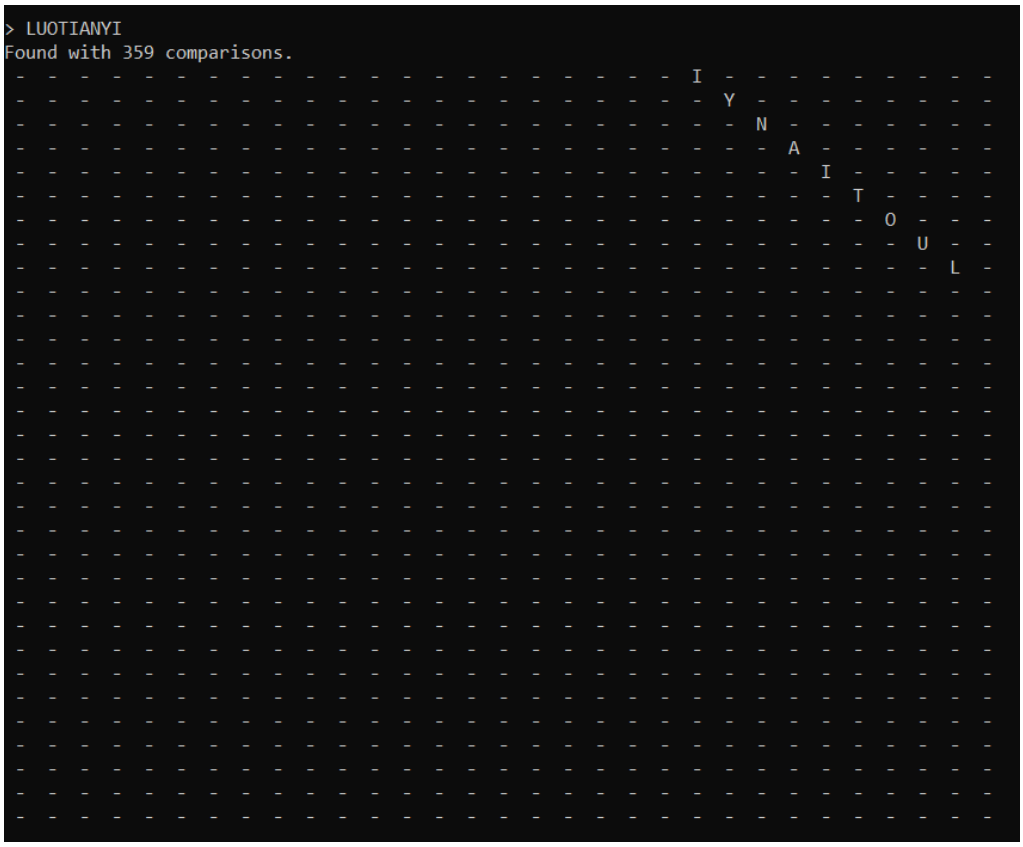

> YUZUKIYUKARI
Found with 510 comparisons.
Y U Z U K I Y U K A R I

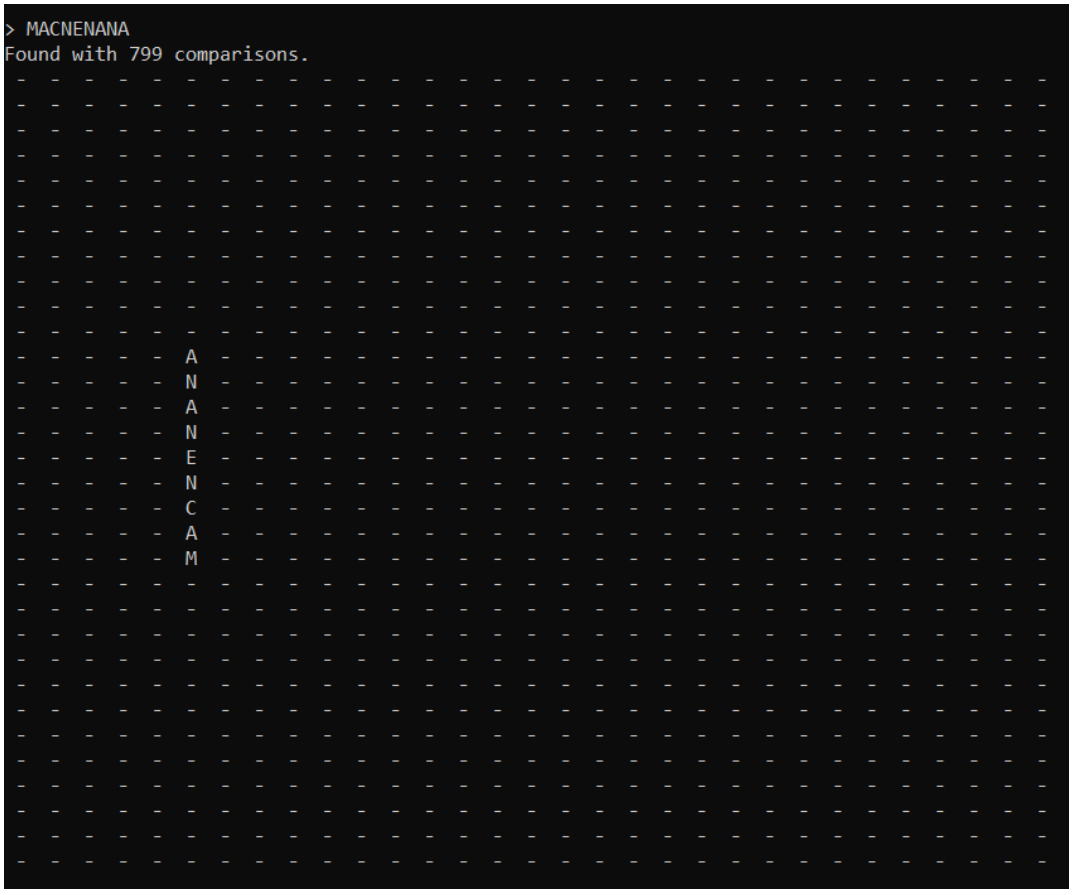

> IAROCKS
Found with 1160 comparisons.
I
A
R
O
C
K
S

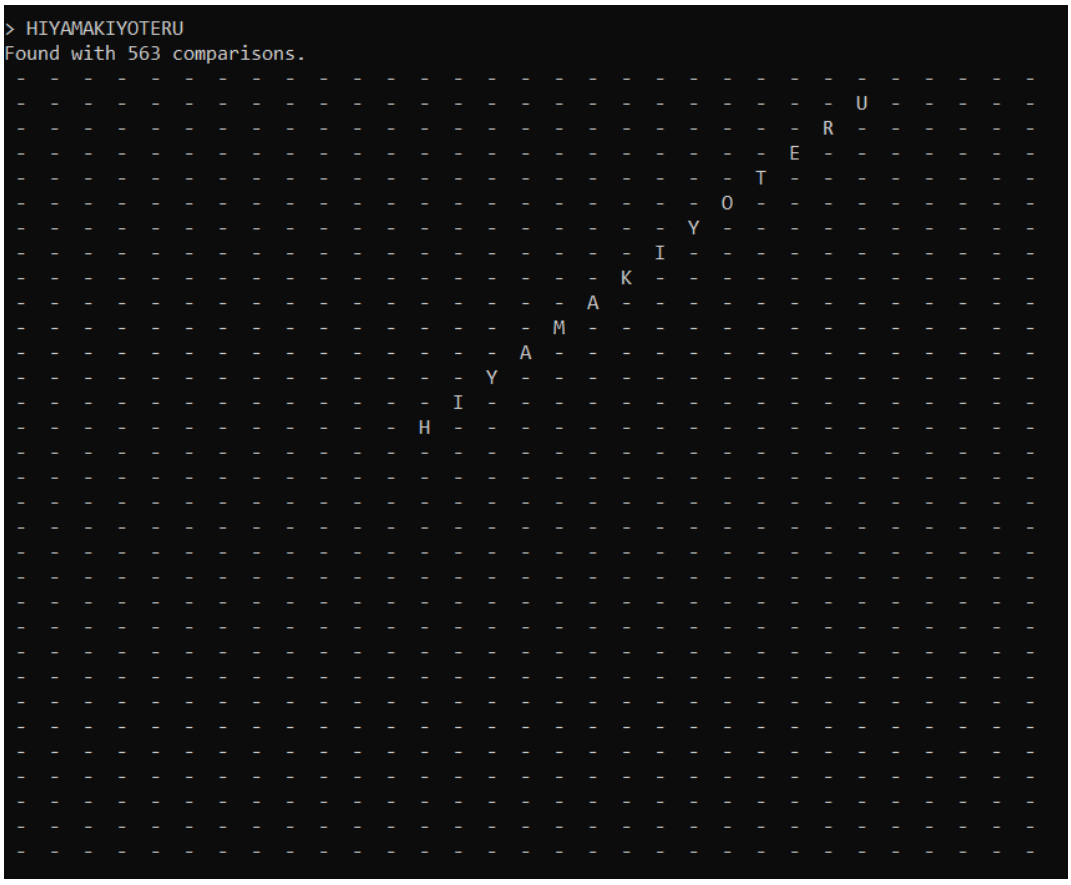

> OTOMACHIUNA
Found with 37 comparisons.

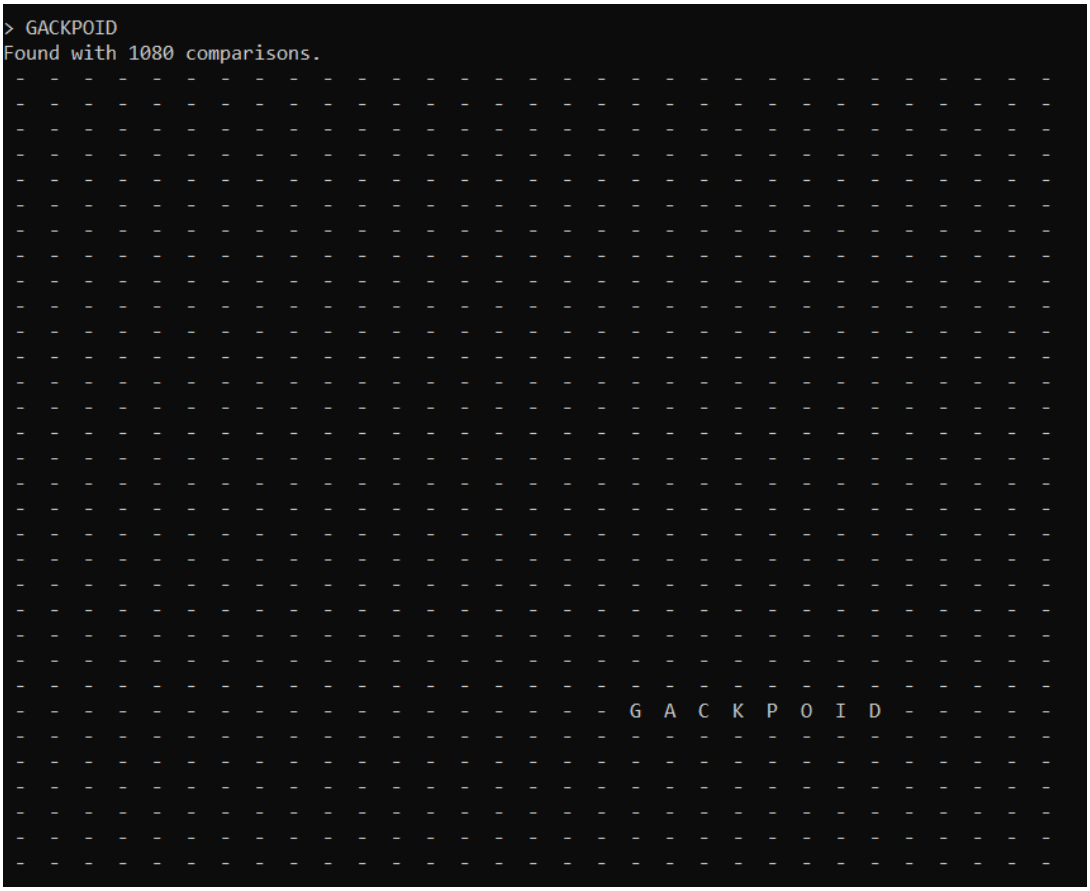

> TOHOKUZUNKO
Found with 278 comparisons.

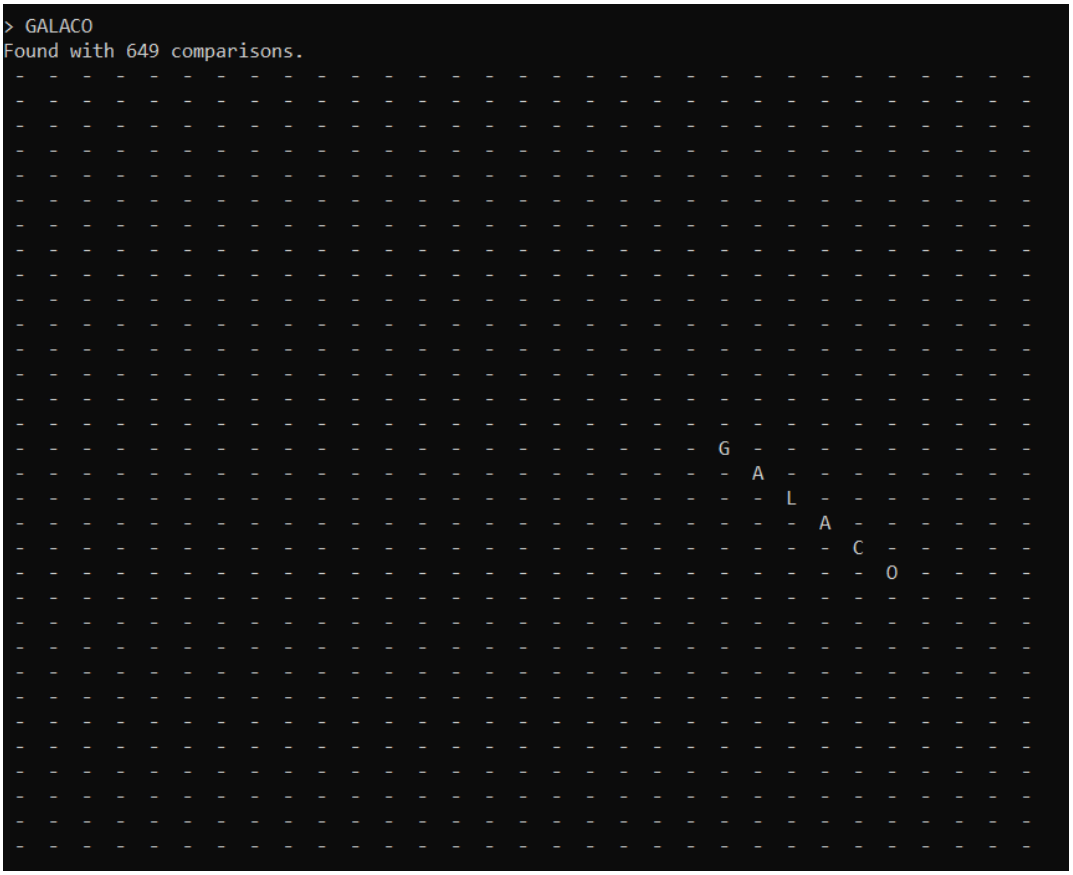

> KAAIYUKI
Found with 352 comparisons.

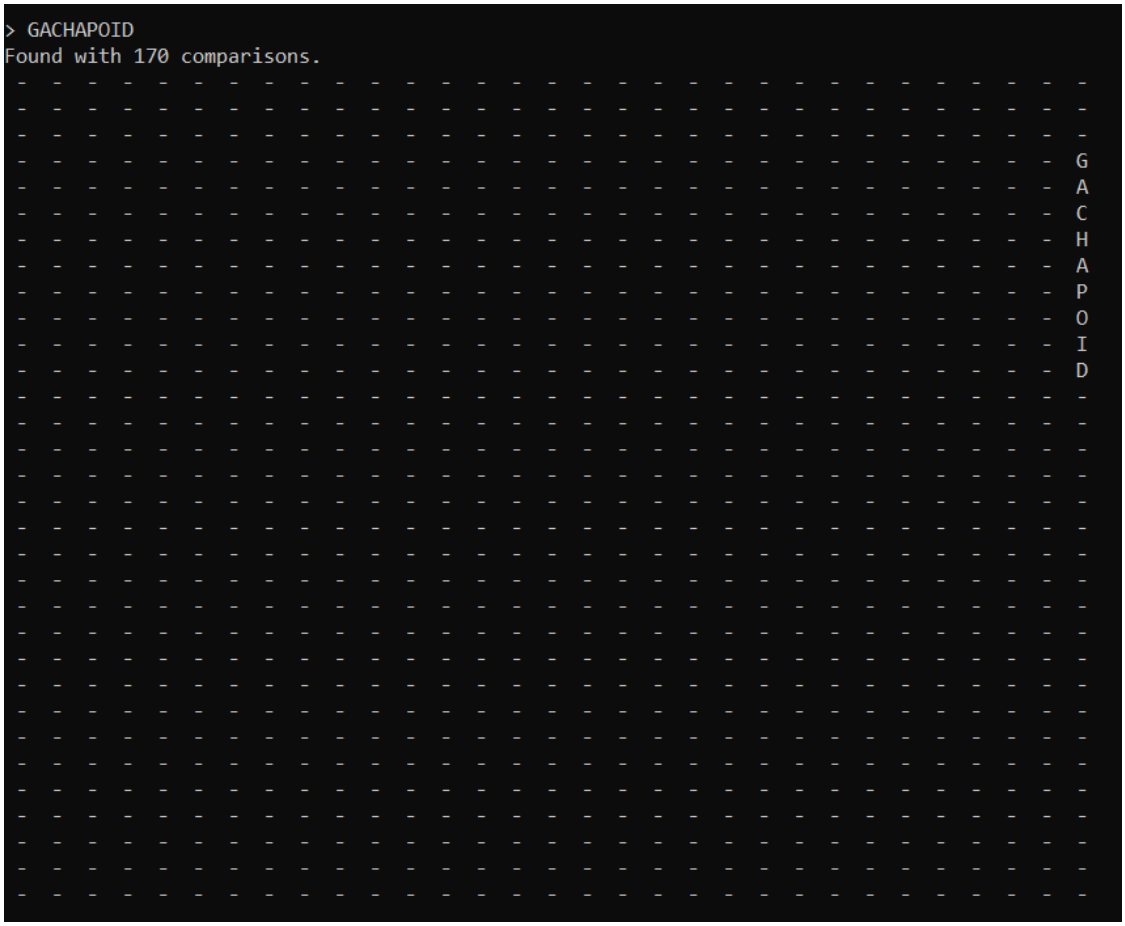

> LUOTIANYI
Found with 359 comparisons.

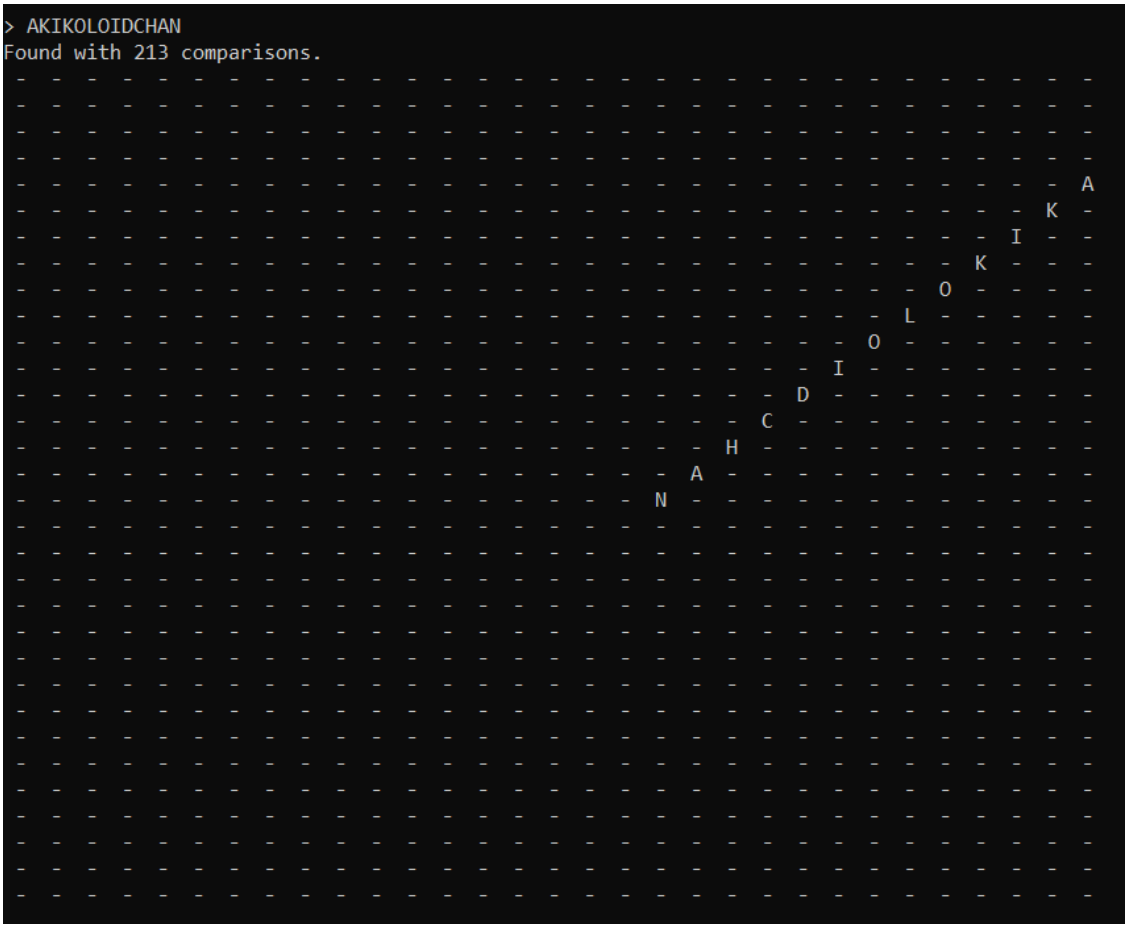

> MACNENANA
Found with 799 comparisons.
A
N
A
N
E
N
C
A
M


> HIYAMAKIYOTERU
Found with 563 comparisons.
U
R
E
T
O
Y
I
K
A
M
A
Y
I
H

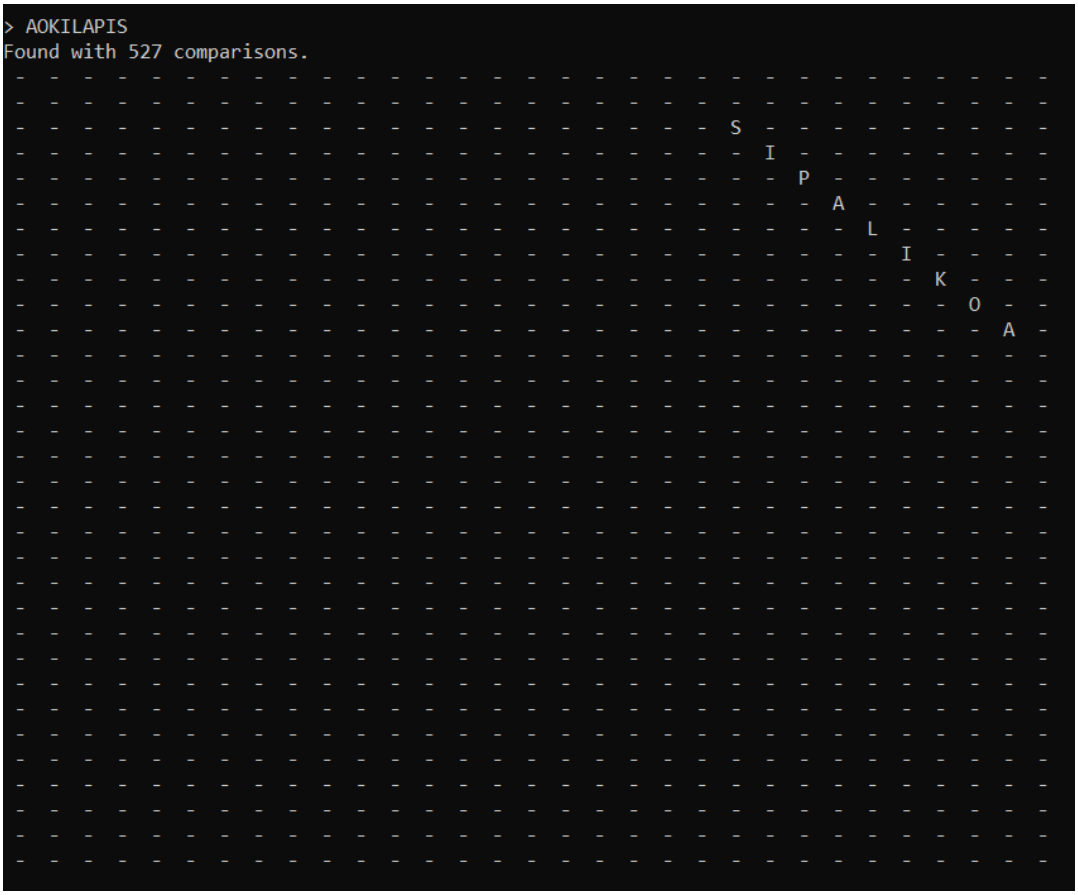

> GACKPOID
Found with 1080 comparisons.
G A C K P O I D

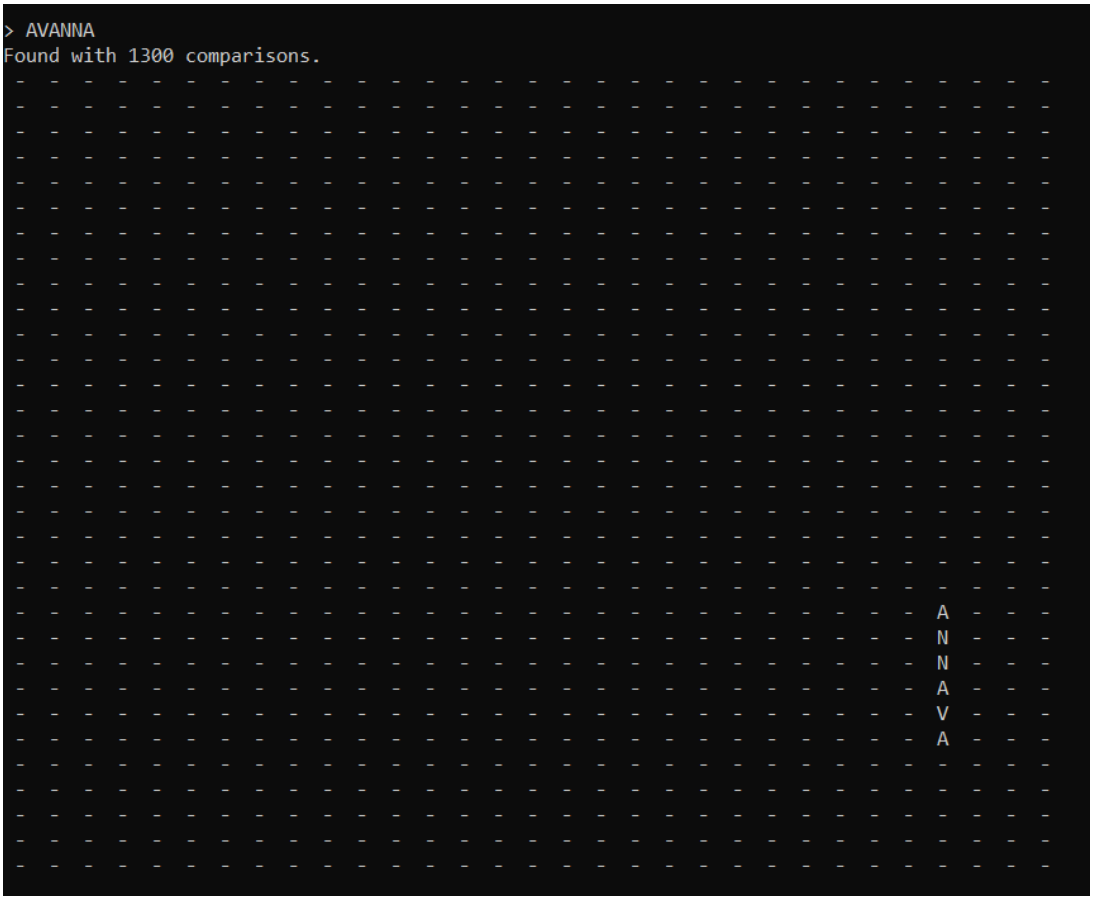

> GALACO
Found with 649 comparisons.
G
A
L
A
C
O

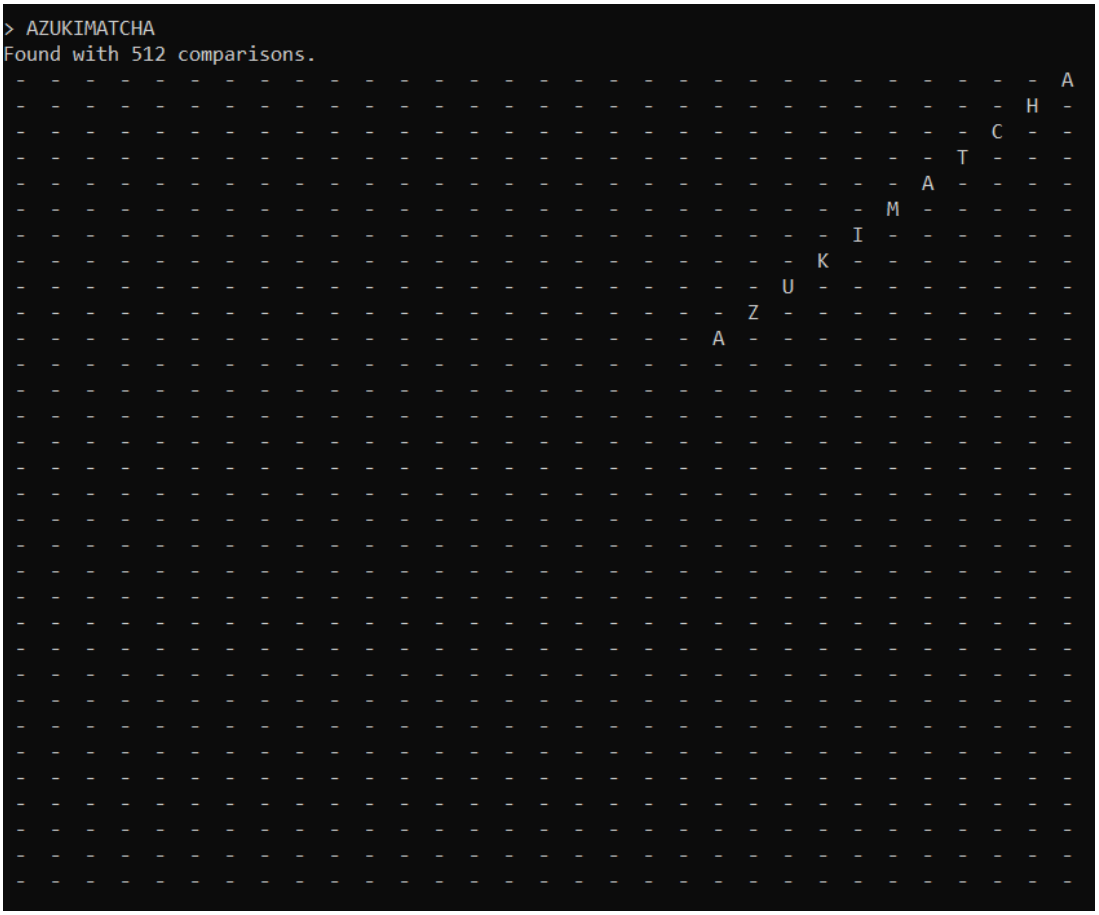

> GACHAPOID
Found with 170 comparisons.
G
A
C
H
A
P
O
I
D


> AKIKOLOIDCHAN
Found with 213 comparisons.
A
K
I
K
O
L
O
I
D
C
H
A
N

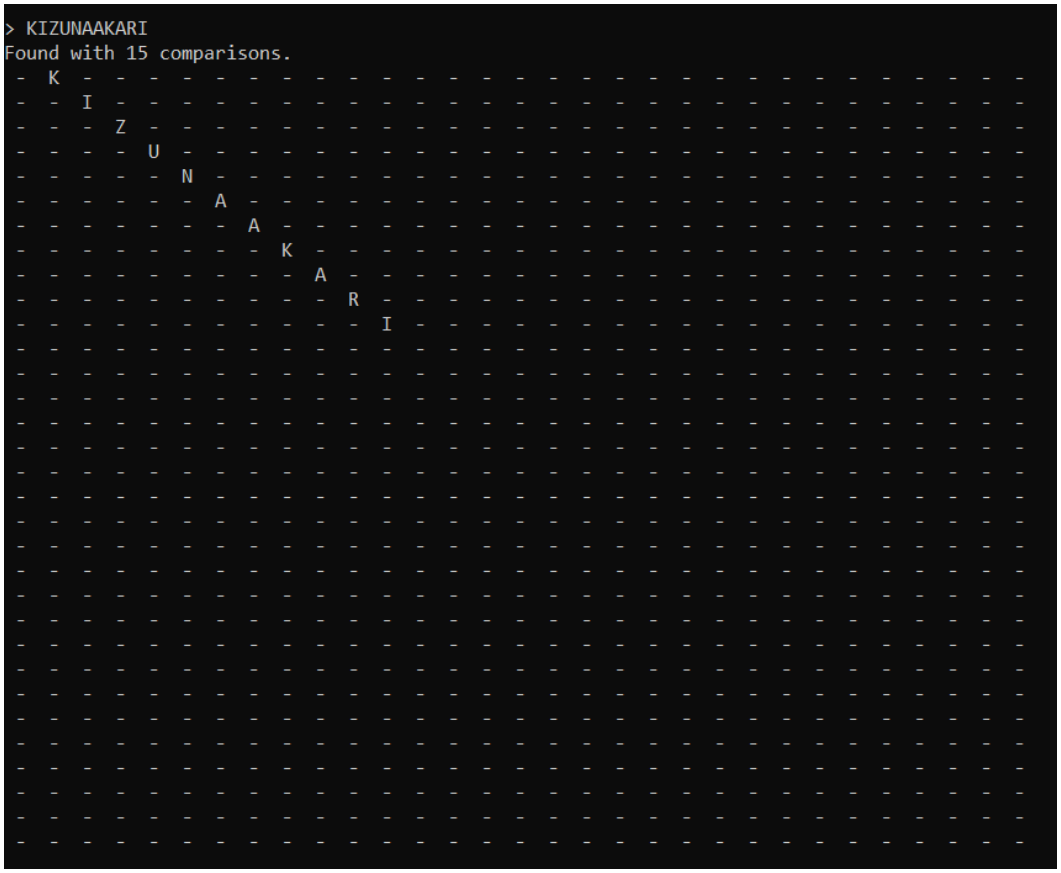

> ANONKANON
Found with 1245 comparisons.
N O N A K N O N A


> AOKILAPIS
Found with 527 comparisons.
S
I
P
A
L
I
K
O
A


> AVANNA
Found with 1300 comparisons.
A
N
N
A
V
A

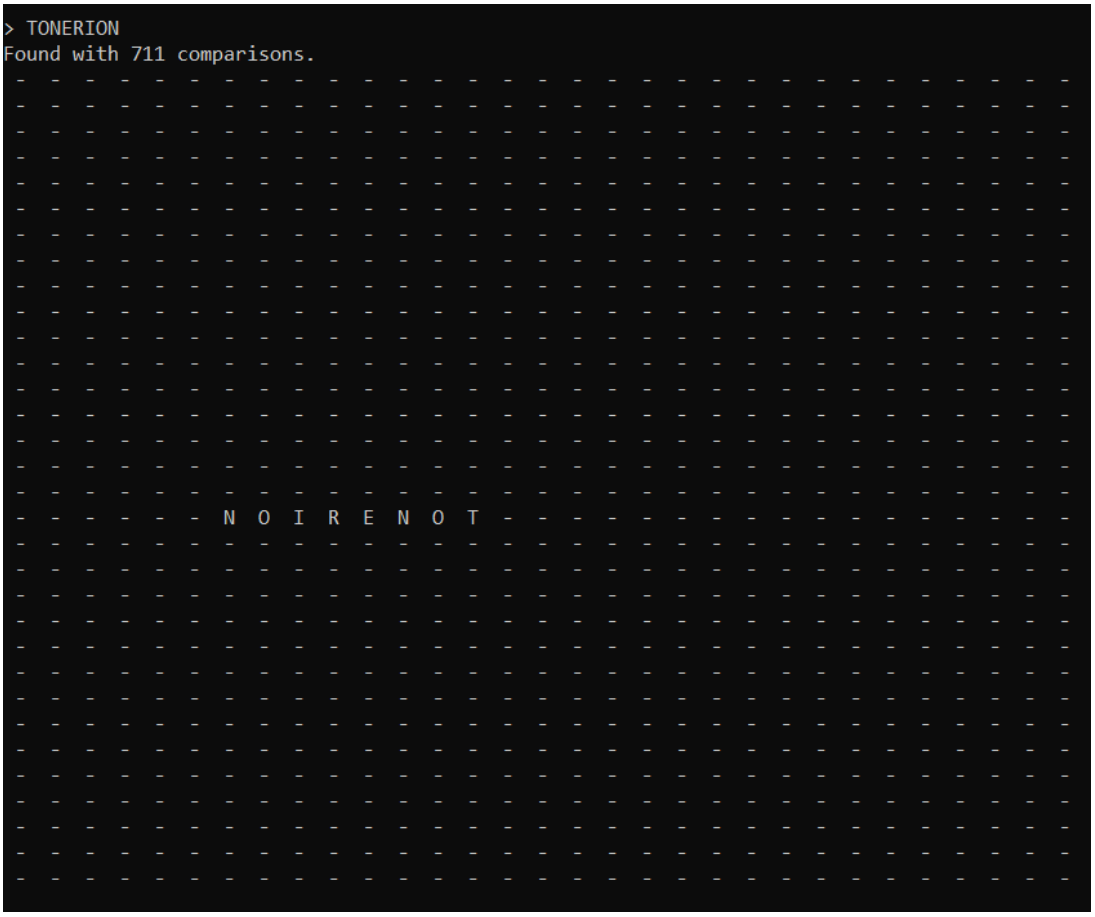

> AZUKIMATCHA
Found with 512 comparisons.
A
H
C
T
A
M
I
K
U
Z
A


> OLIVER
Found with 1306 comparisons.
O L I V E R

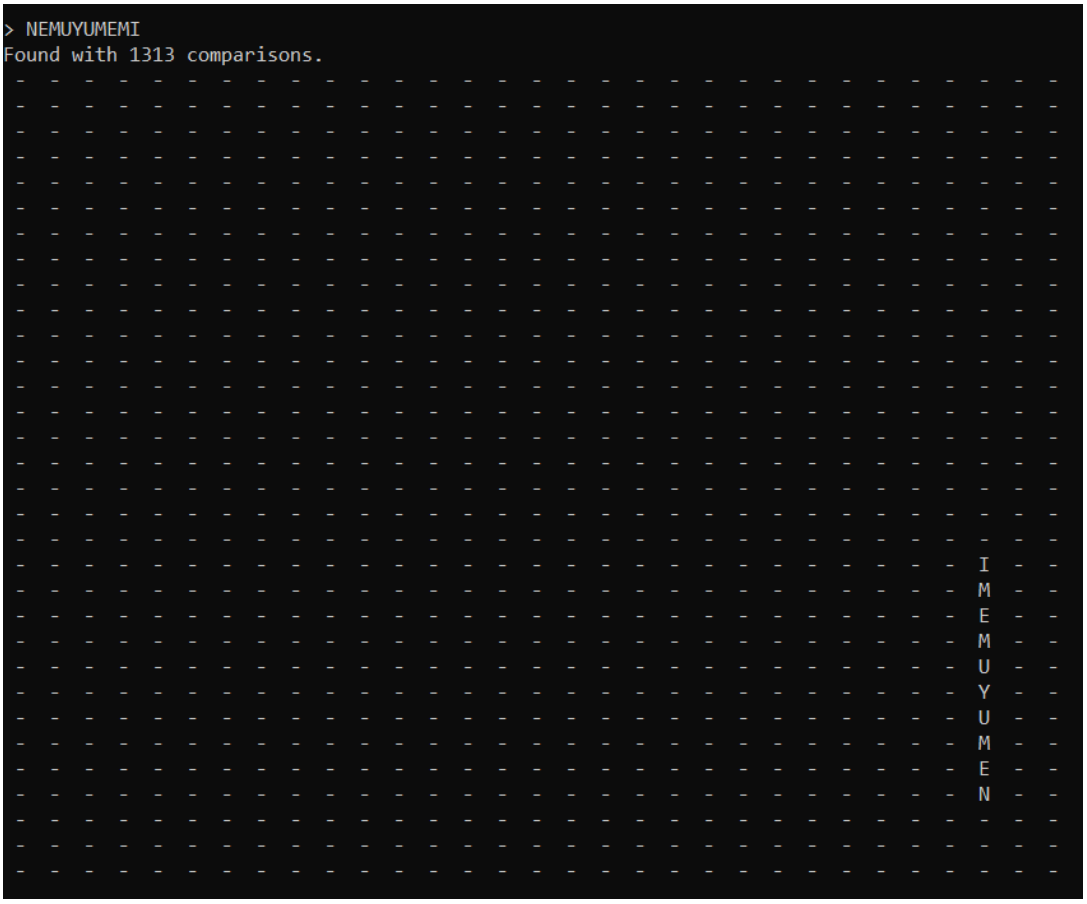

> KIZUNAAKARI
Found with 15 comparisons.
K
I
Z
U
N
A
A
K
A
R
I

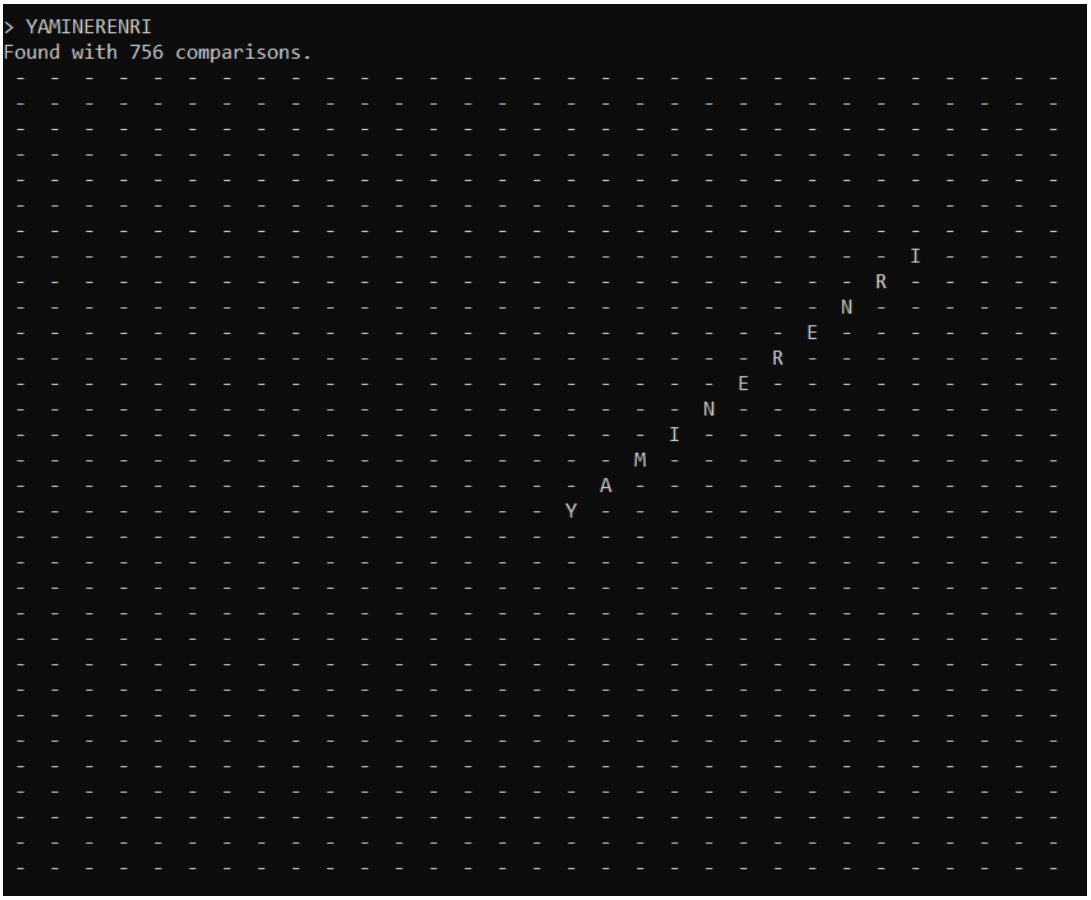

> KAITO
Found with 782 comparisons.
K
A
I
T
O


> MEIKO
Found with 811 comparisons.
M
E
I
K
O

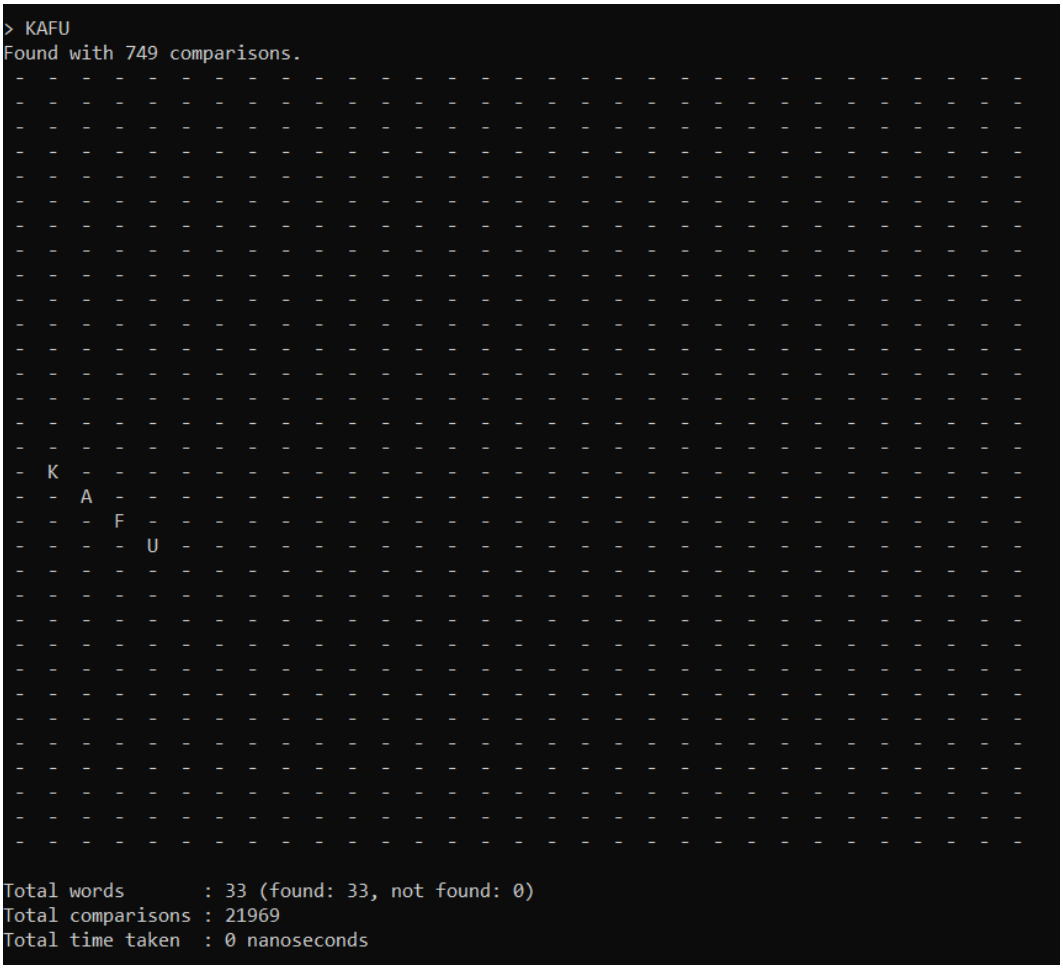

> TONERION
Found with 711 comparisons.
N O I R E N O T

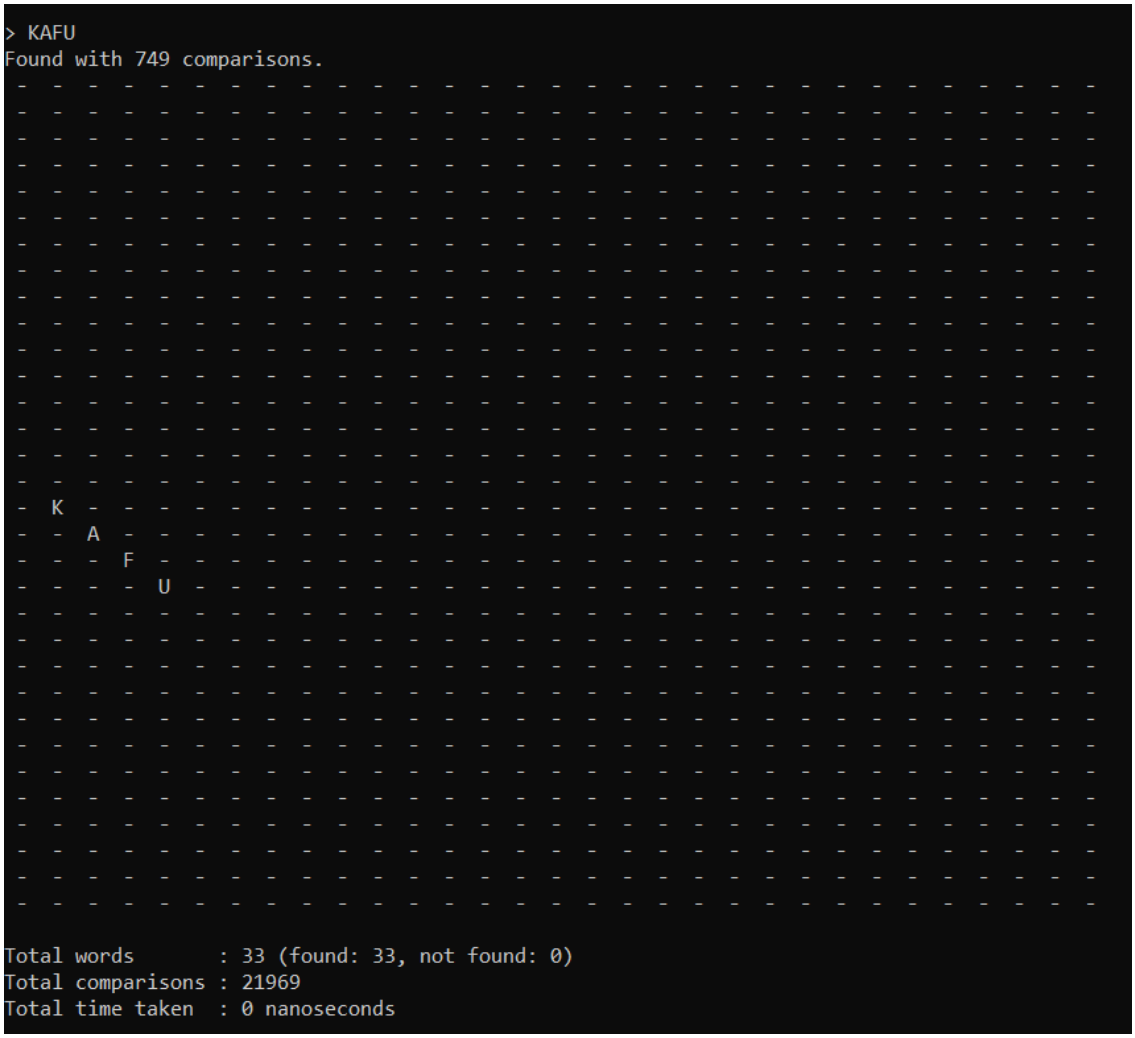

> SWEETANN
Found with 1153 comparisons.
N
N
A
T
E
E
W
S


> NEMUYUMEMI
Found with 1313 comparisons.
I
M
E
M
U
Y
U
M
E
N


> YAMINERENRI
Found with 756 comparisons.


> KASANETETO
Found with 459 comparisons.
K A S A N E T E T O


> KAFU
Found with 749 comparisons.
K
A
F
U
Total words : 33 (found: 33, not found: 0)
Total comparisons : 21969
Total time taken : 0 nanoseconds


> KAFU
Found with 749 comparisons.
K
A
F
U
Total words : 33 (found: 33, not found: 0)
Total comparisons : 21969
Total time taken : 0 nanoseconds

H. lg-2.txt

```
C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/lg-2.txt
                                        33 x 33 PUZZLE
 I J N T F W N N K F P U L L E M T J L B V P N I M K X Y P K T V B
 E N P R A U U J S D U G U L A C A V H Q T H A K K L I Z S K R C N
 C Z A O X T B P K W S V X T J S I I C O K J Y W T I P K Z N T Y A
 Q E K B X R G W E V U A F N F P T M V C A X U T S L H R U Y B D K
 N L B T A E F Y S V U N O B F O C N I I D Y T P B Z U S H O L S K
 O Q X X U K B H A K U R O U S A P K O M C E A W I M E M I V L O W
 J X Y Y C Z U K N T P E Y H E L P I A T M C L R H A C H I J A T U
 Y T B E L F W M B X Q D I C Y E M Z E I E P I Y X F S D Z Z E J W
 D C T P I D M K O R B Z R N T E X Z R W R X E F C U L J T O S N D
 B P C F W H V D V R U S Z L I M L T V S V I N O G M T D W Q U C F
 K K G M F R E J I K I H X B L U N D W Z R I K A Z A T I W D Z X J
 N O B E K X X Y U R H N U J F Y J E Q M K E D I G F M J K B I A J
 I W S J F H H Y J M A I O G G D N C C L U K R W B U E E F K B T G
 I K A E K A T A D A W J T N K G T O V F N O M U Z E Q S S K M I X
 Q O S Q J R S Y V A W E Q G P E Z A M A L T K U L C A S U W X H Z
 Y L L I D A C C I P E C I L O P K U N M D O P L Q I W R H W H S N
 Q L X Y I L R F M M T T O C S C O S M O S A Q A J N L X Q M C O H
 U Y S M D K S V S J F X D Y L V B J Z O G E F R G Q A I D P K N H
 S Z J R N S F K I A S I X K G E M L N O N N L C N I D U B H O I E
 Z E T V C A E R R W H H D M E H Q P A W O P A W O P G A I F T K K
 E G T S R U O M H Z O A M U M U S N X R X A K K V H J Z M K L A A
 U T P N F Y B N Q S X D R M T K I A X Q G L E D C A V R V P N X P
 O T A I O S C O W W P E A J R K Z E N D D M K H F Z U F K Z A D F
 J P E K J M R D W O N G Y Q I A A H A R U M A K I G O H A N I K E
 C R M R F O E A I U Z Q J P P K B W Q D N R O I G W Z K Q M R Q P
 W E O F A C I H M A P J G O R A N G E S T A R G W K I P X H A J U
 R V K B K M C H W A N U B N E W X S F C M W O V Q I P I Z R N K X
 M G S X J C G J C C M M Q V S O Y H K R C K G C O M X Z Y Z A L L
 F G N T O M F C U A D E E B U W N B N N R Y T R I Y X L P E K M B
 M N Y N O M K T Z M H T Y G W U D G A A K U I K U E R U K A S A S
 Q L I M B J S M N F V E M O L W Y O P Q L K K W R W A A G L K W E
 K P S L T U G Y I O F I F A V S R Q S U Z C T T Z X T W R W Q N I
 W I B M P B U K H O R O N G D A P M N Y Y T L S S R J N K R K G Y
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> POWAPOWAP
Found with 833 comparisons.
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
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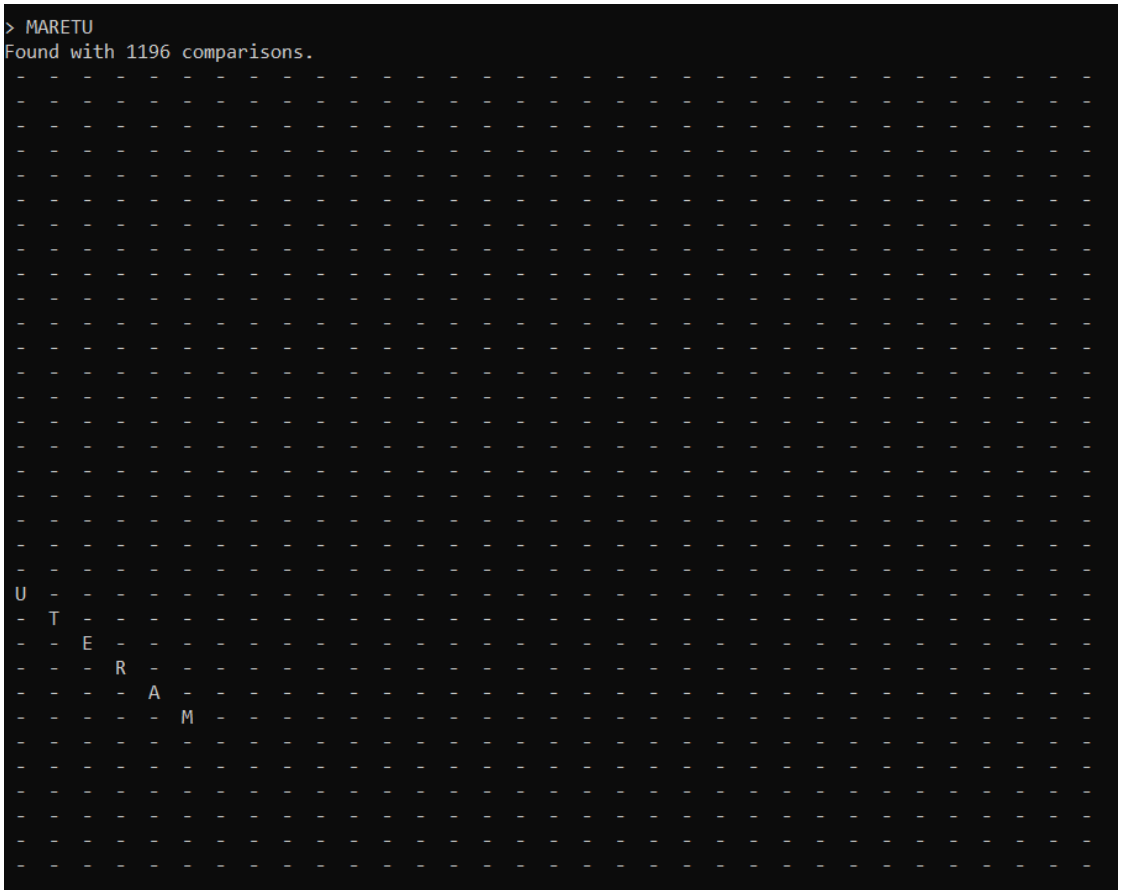
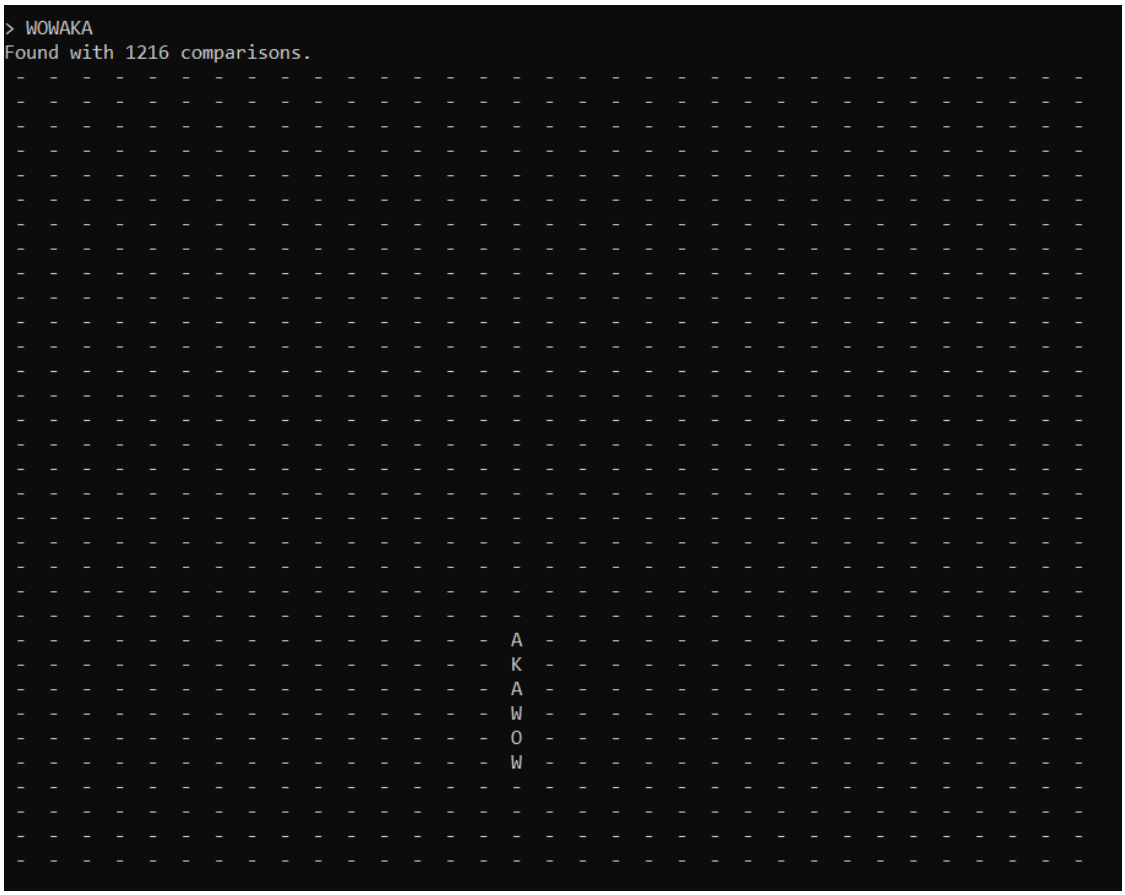
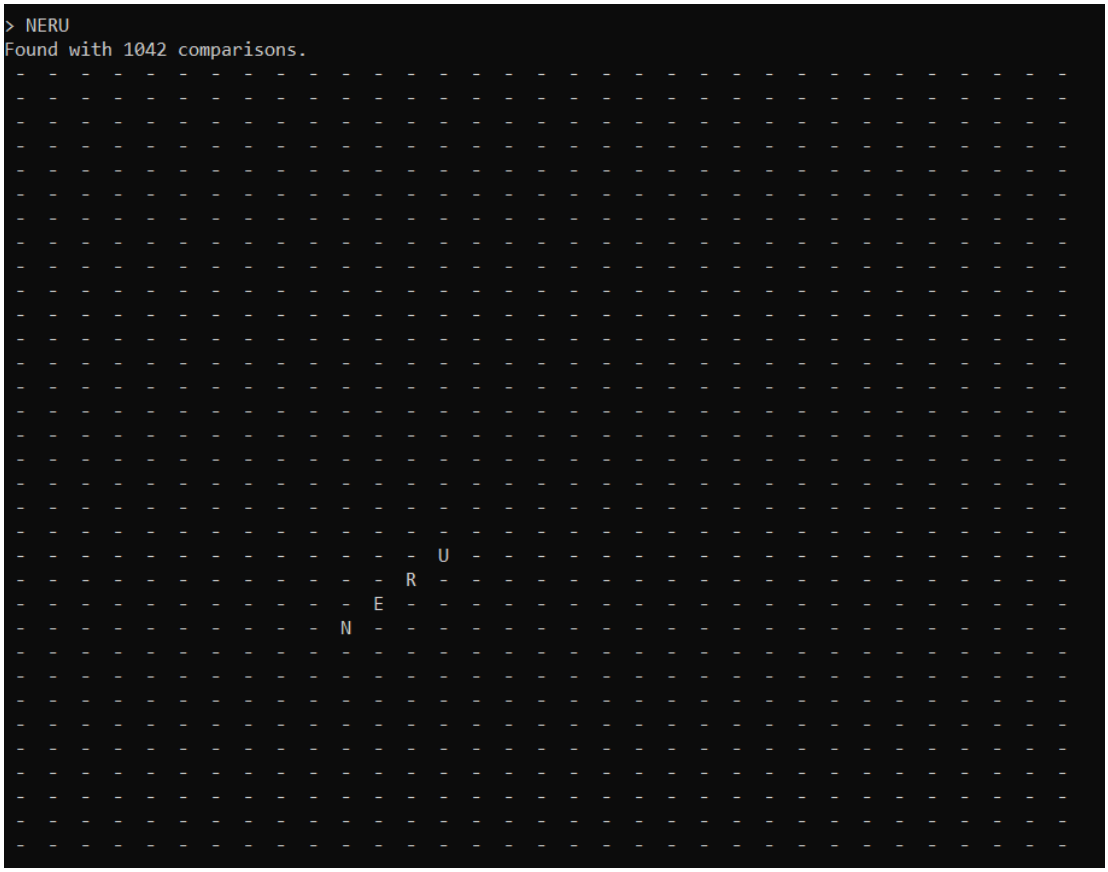
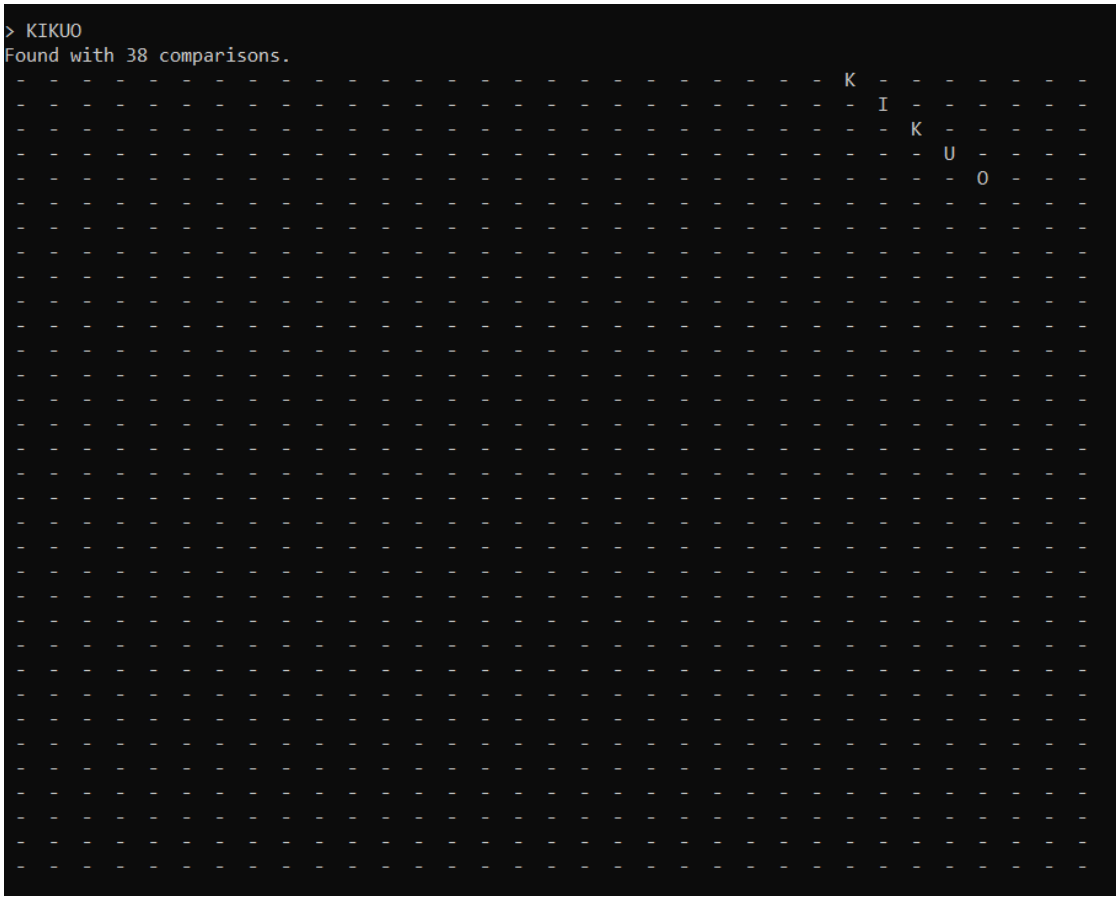
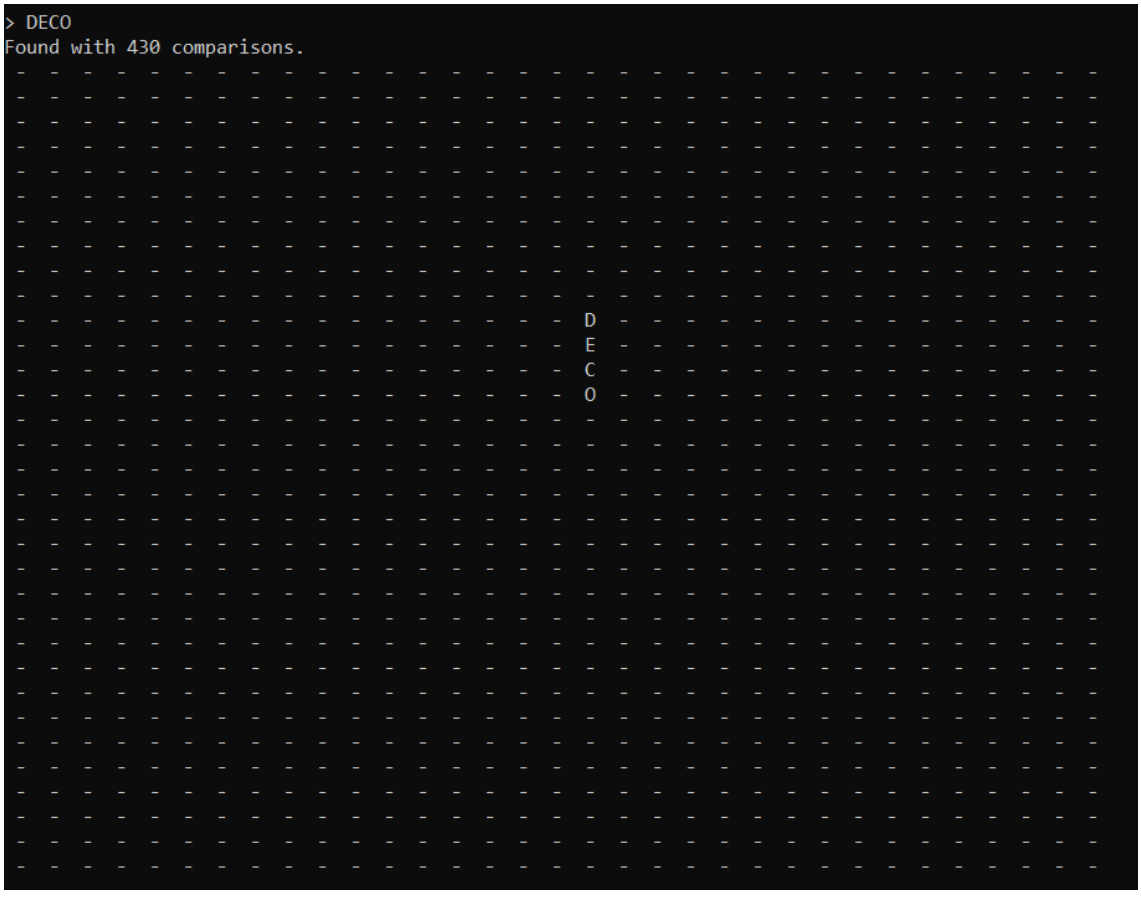

> MARETU
Found with 1196 comparisons.
U
T
E
R
A
M

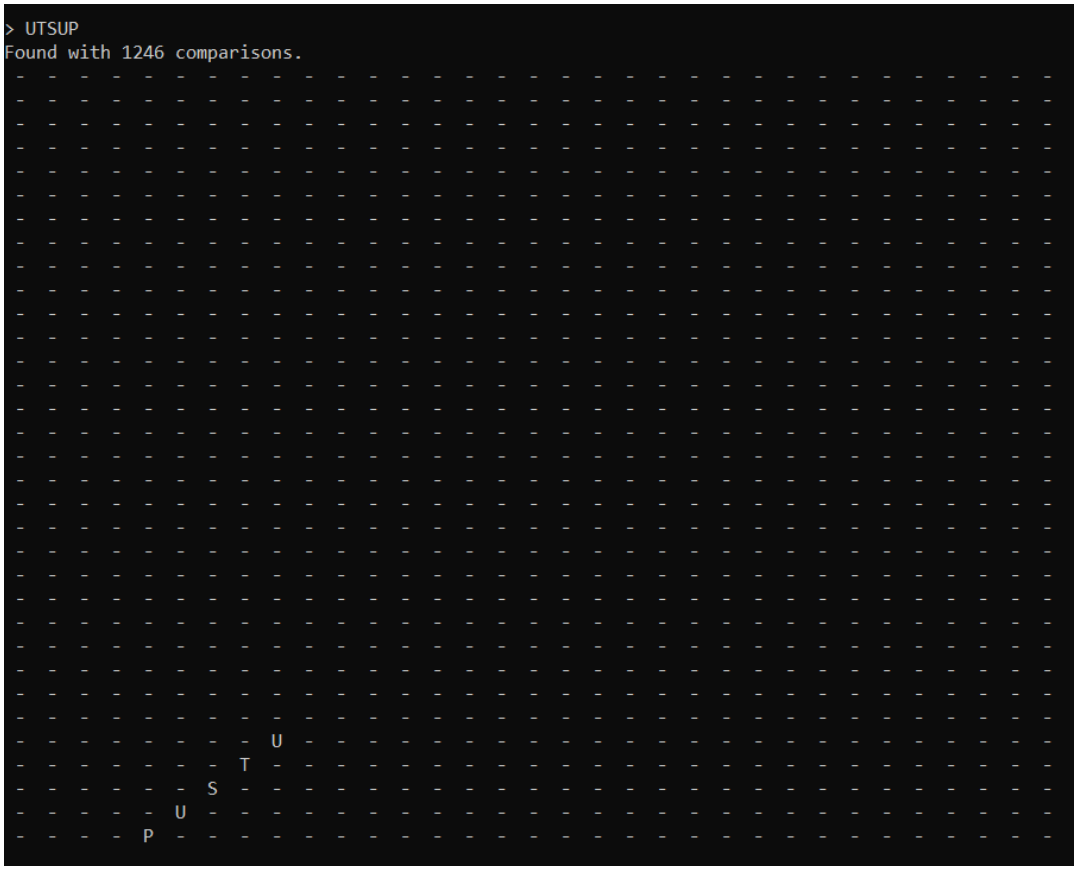

> WOWAKA
Found with 1216 comparisons.
A
K
A
W
O
W


> NERU
Found with 1042 comparisons.
U
R
E
N

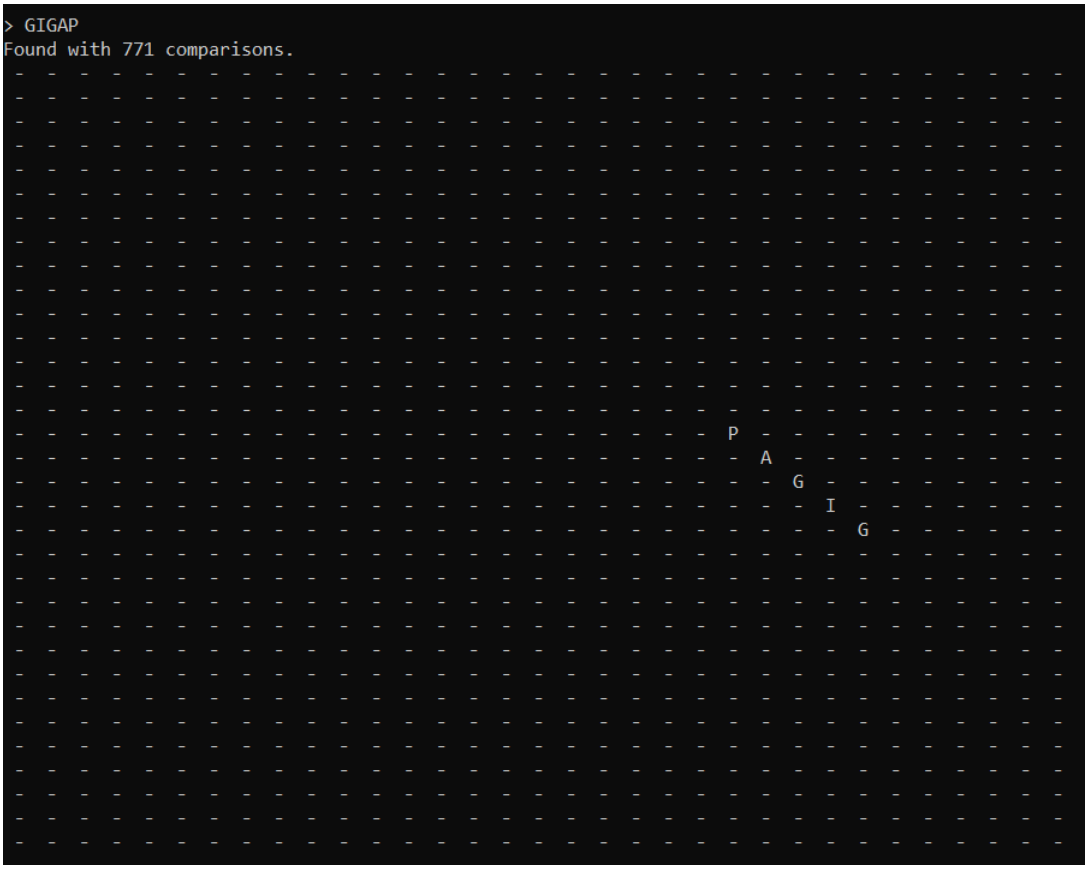

> HACHI
Found with 277 comparisons.
H A C H I

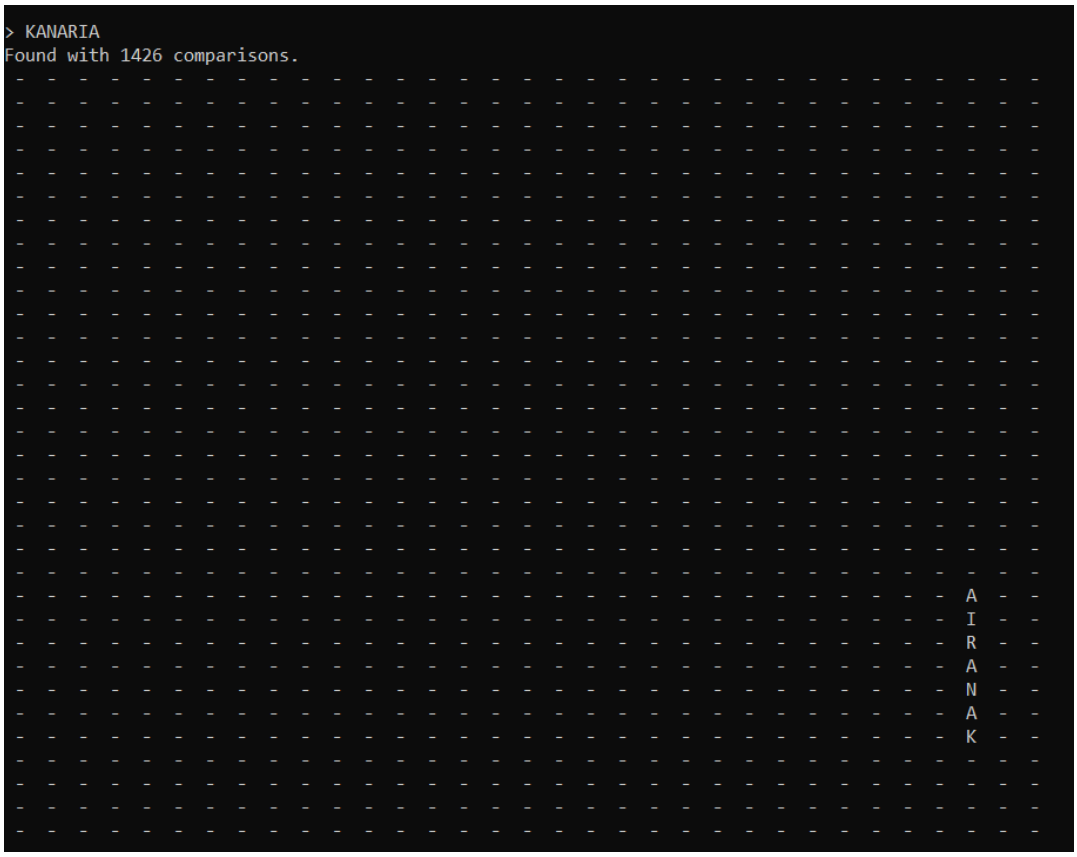

> KIKUO
Found with 38 comparisons.
K
I
K
U
O

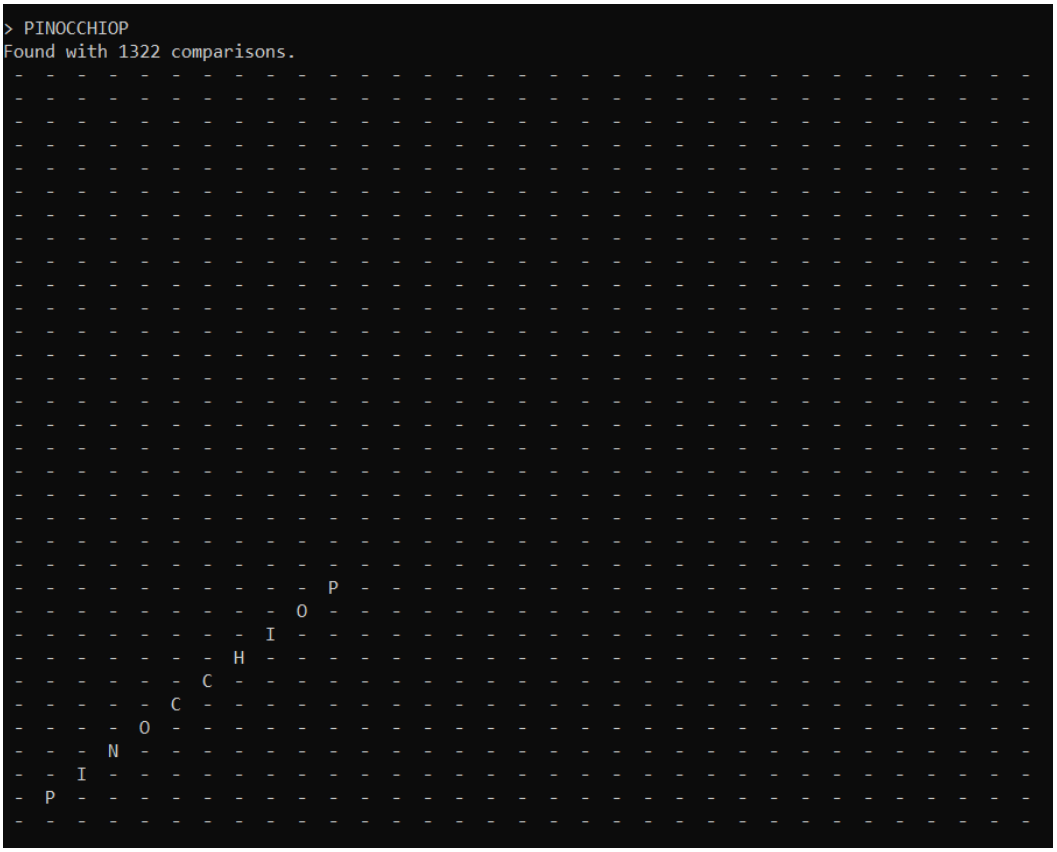

> DECO
Found with 430 comparisons.
D
E
C
O


> UTSUP
Found with 1246 comparisons.
U
T
S
U
P

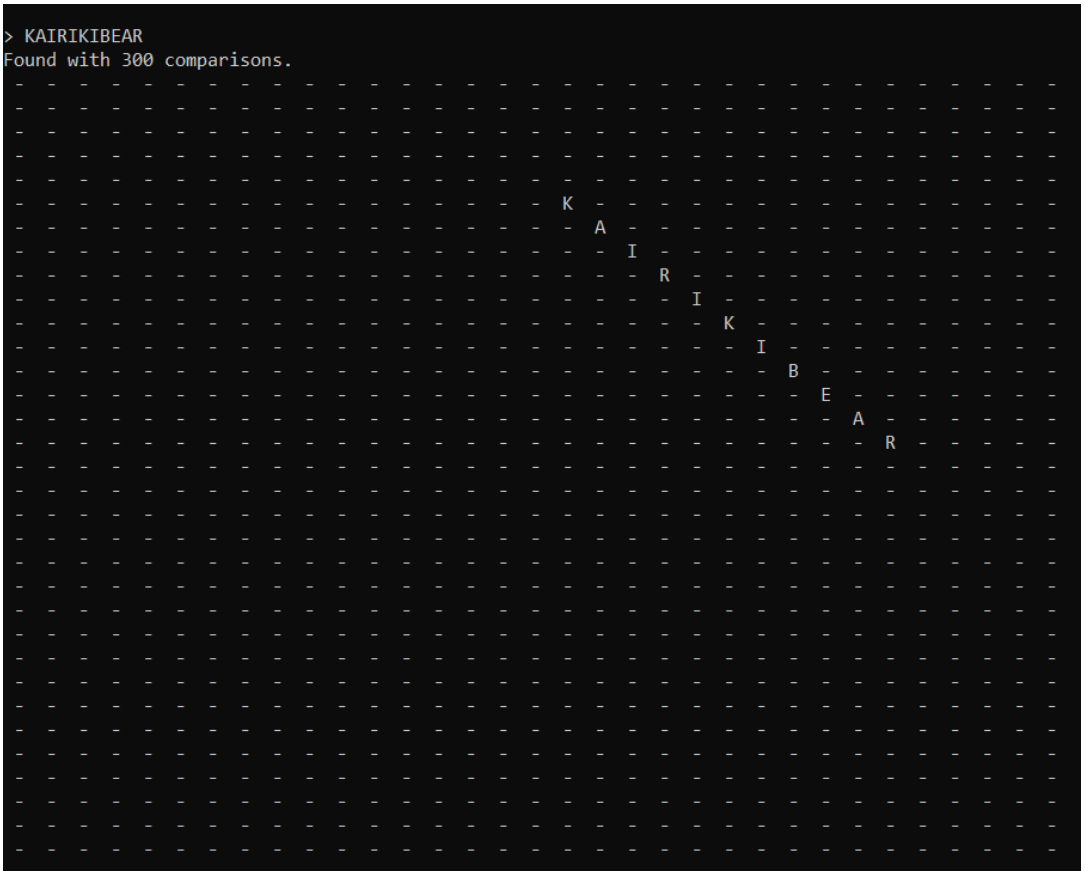

> NBUNA
Found with 1179 comparisons.
A N U B N

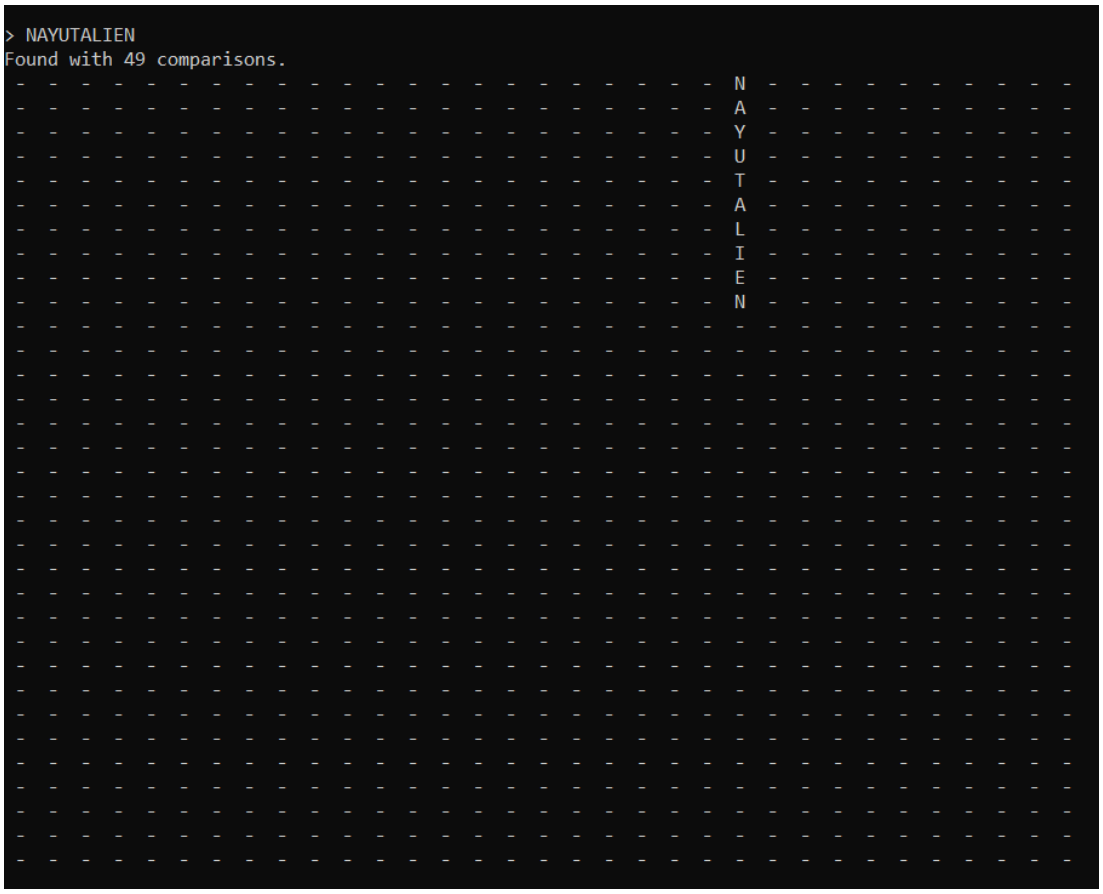

> GIGAP
Found with 771 comparisons.
P
A
G
I
G

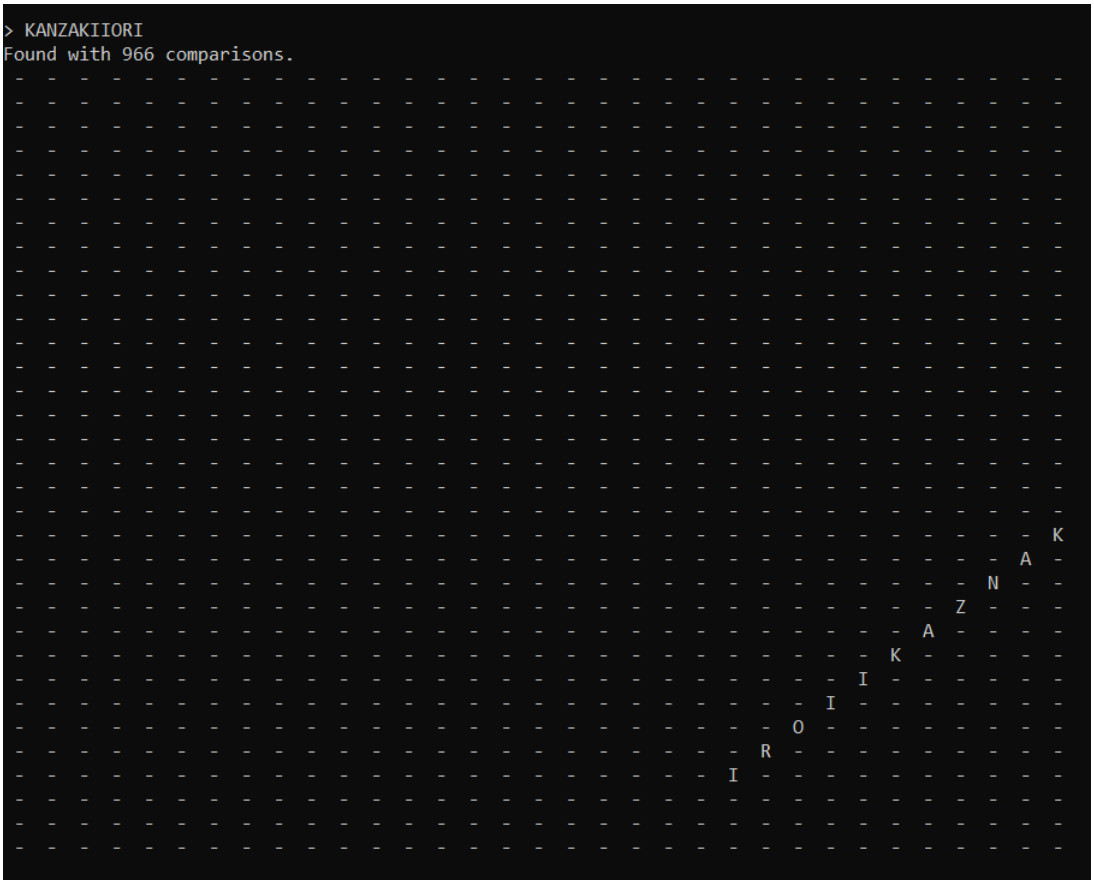

> KANARIA
Found with 1426 comparisons.
A
I
R
A
N
A
K

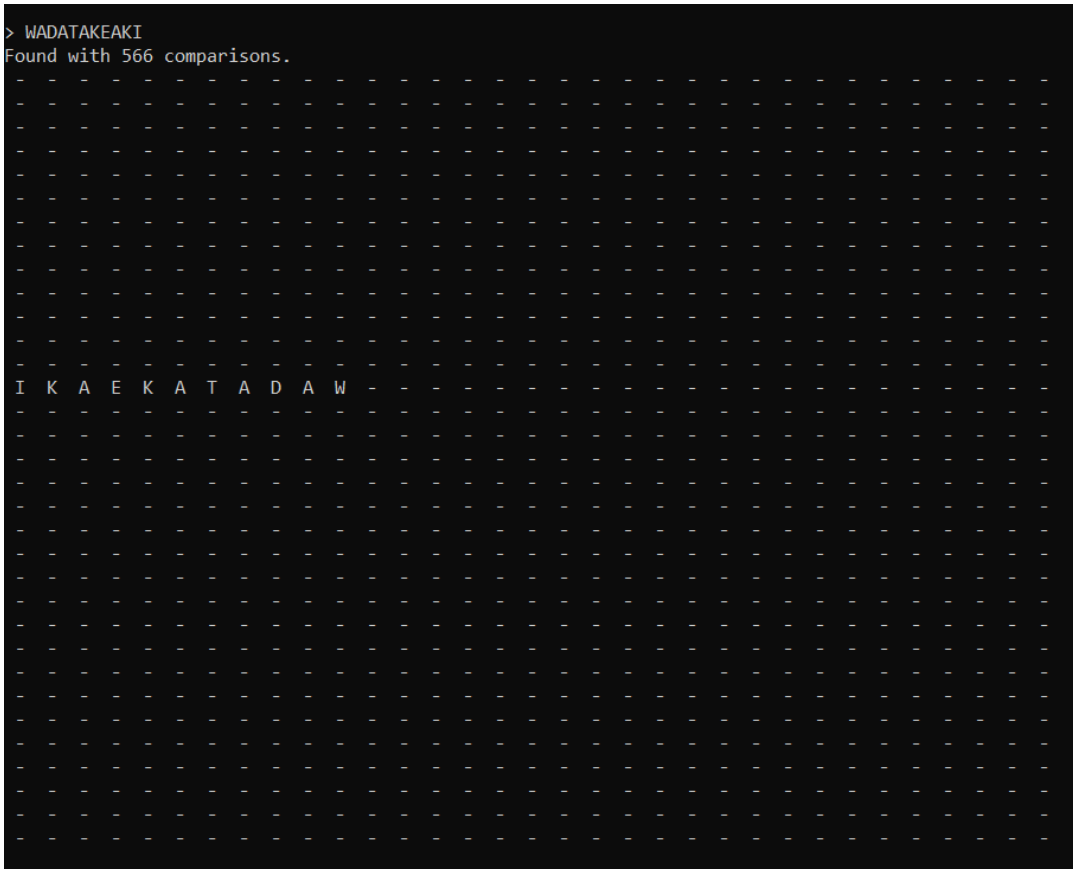

> PINOCCHIOP
Found with 1322 comparisons.
P
O
I
H
C
C
O
N
I
P

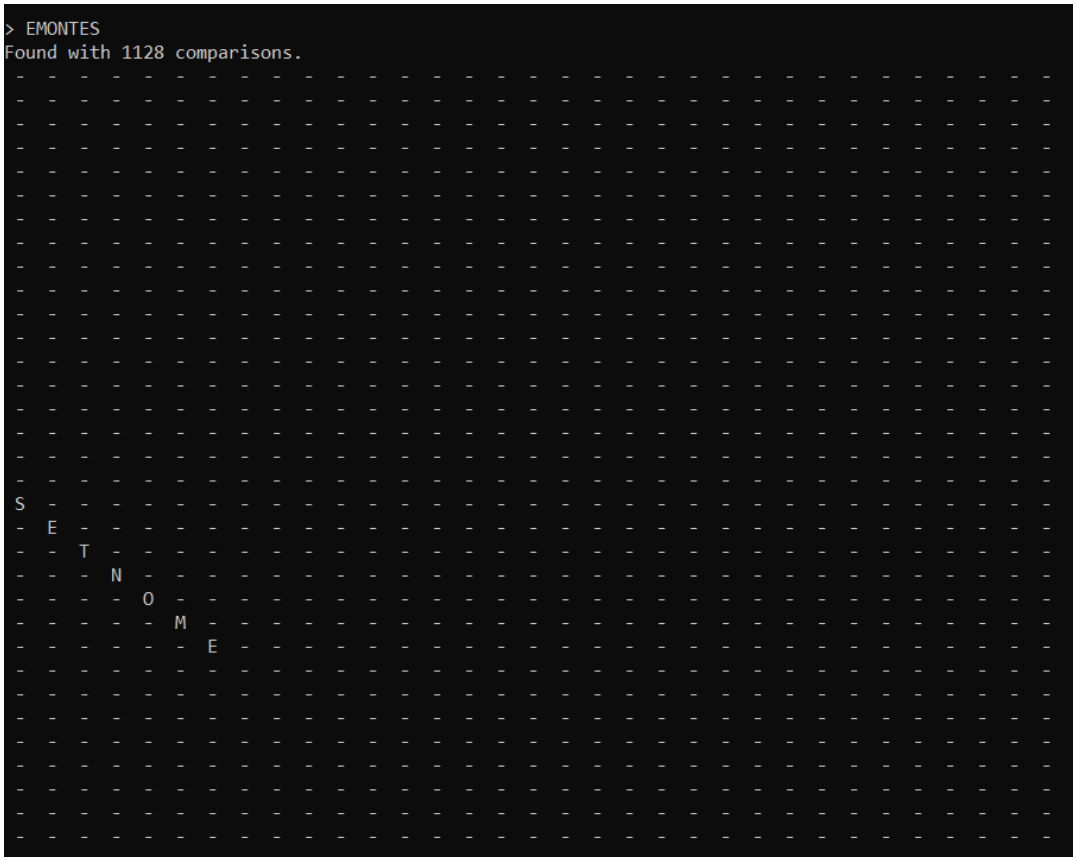

> COSMO
Found with 730 comparisons.
C O S M O

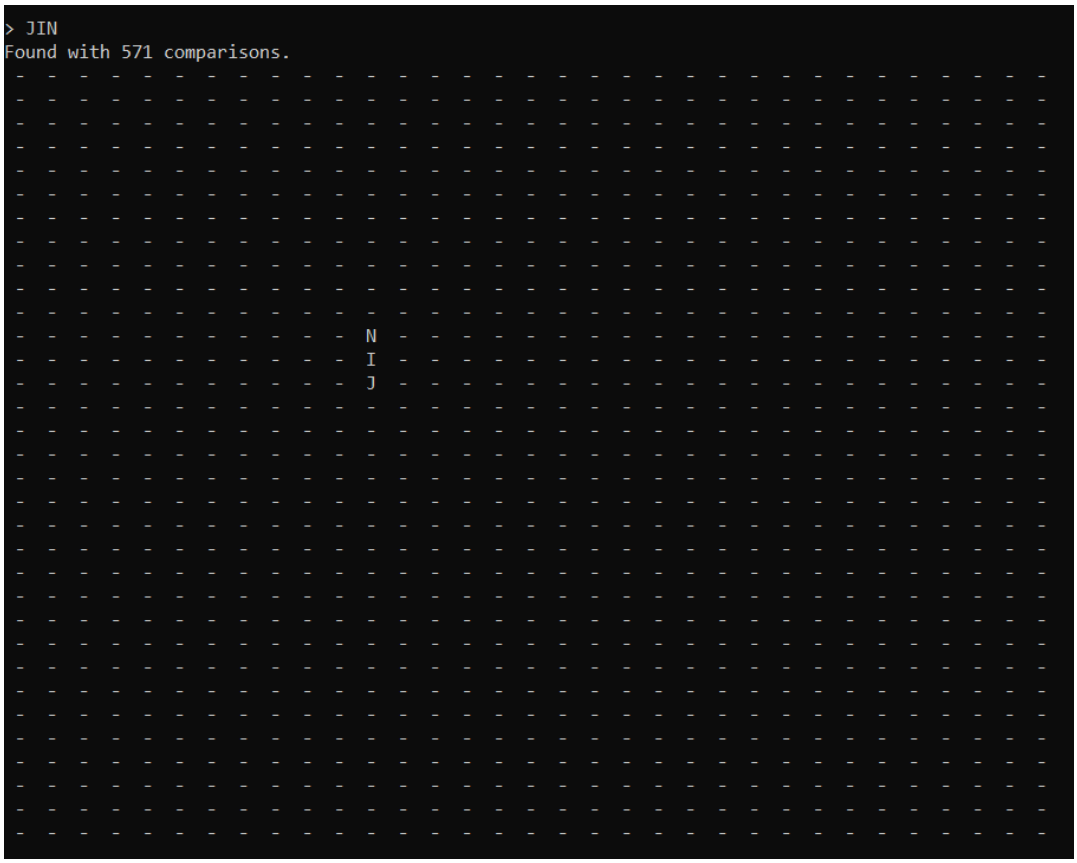

> KAIRIKIBEAR
Found with 300 comparisons.


> NAYUTALIEN
Found with 49 comparisons.

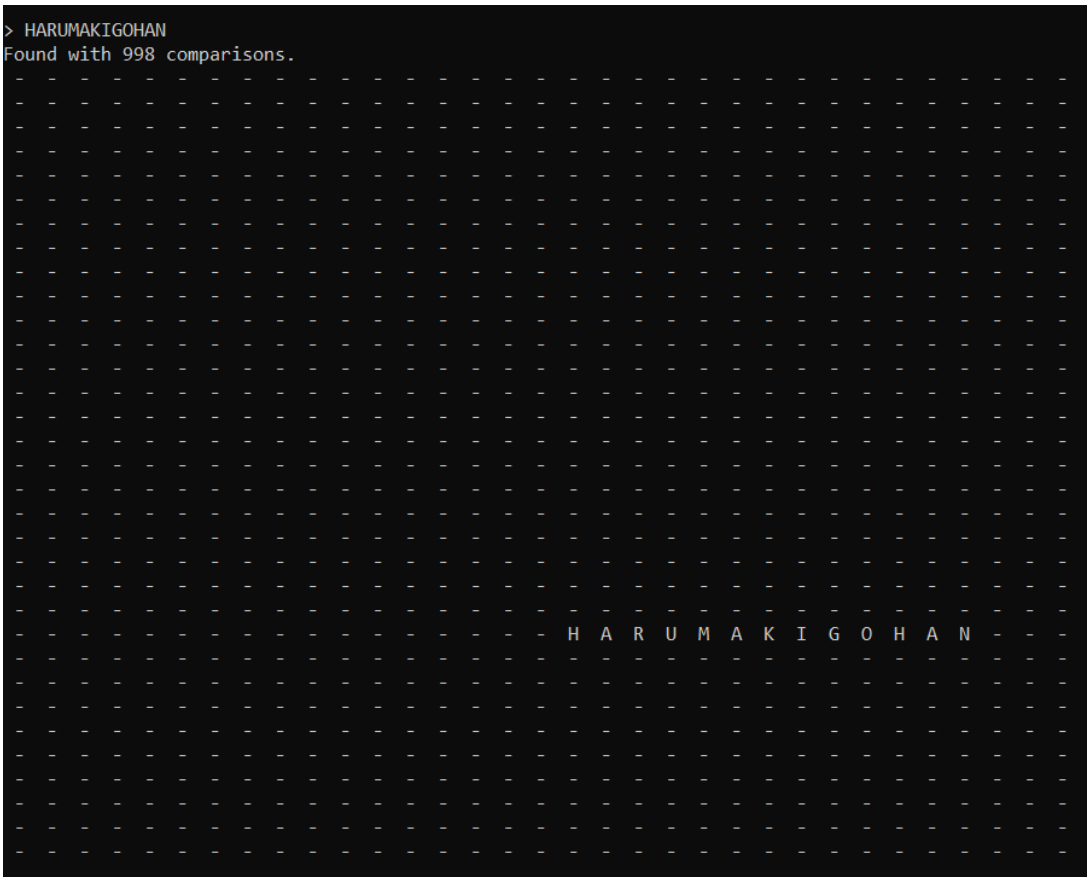

> KANZAKIIORI
Found with 966 comparisons.

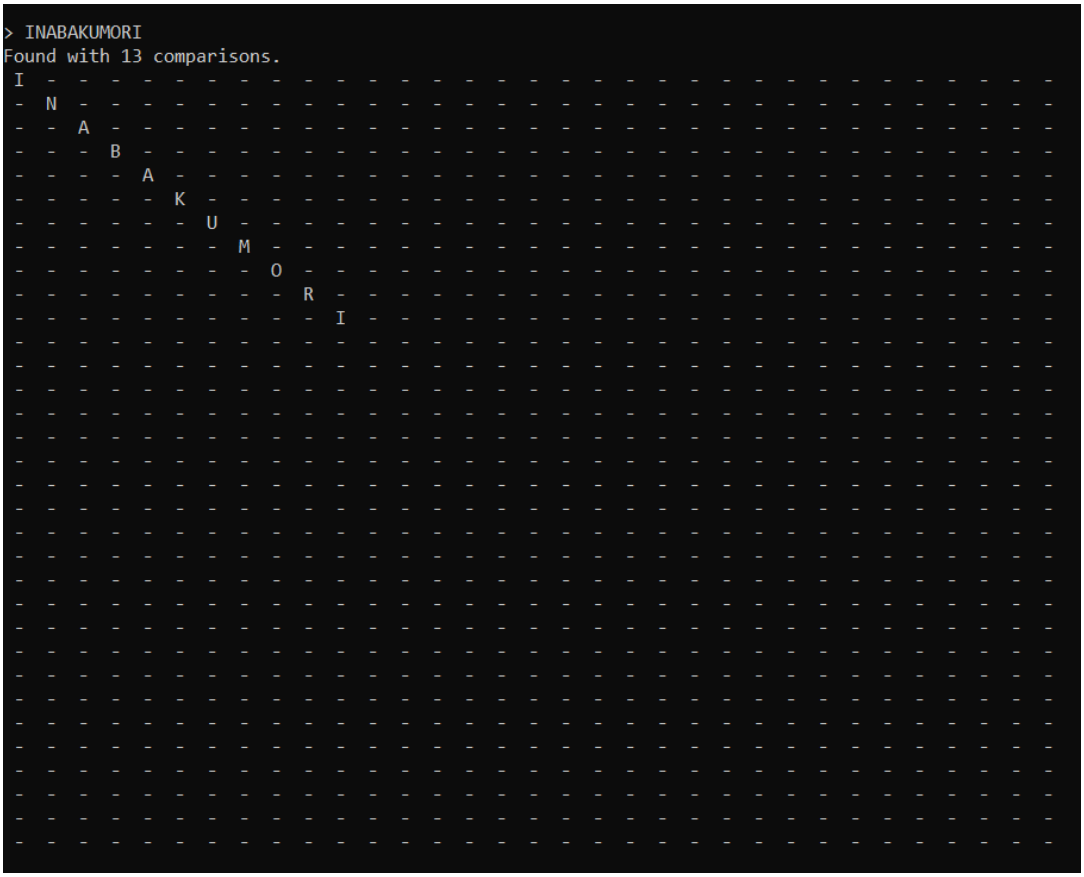

> WADATAKEAKI
Found with 566 comparisons.
I K A E K A T A D A W

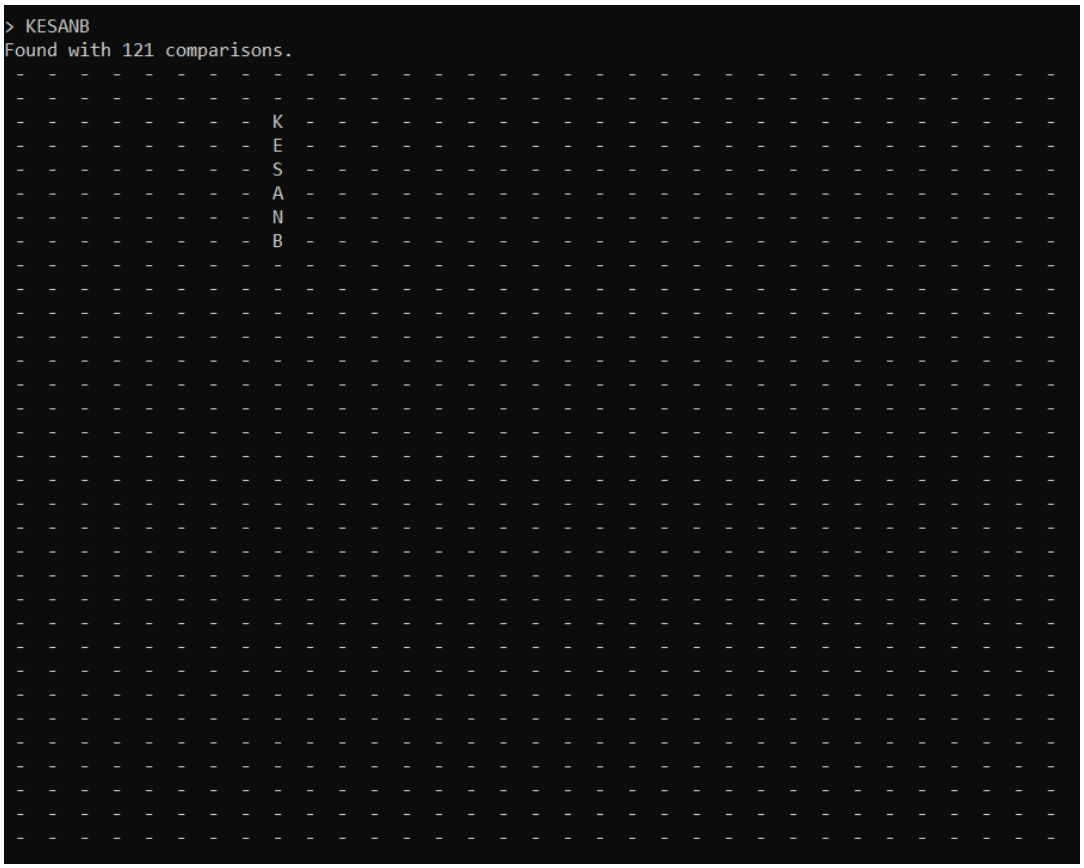

> EMONTES
Found with 1128 comparisons.


> JIN
Found with 571 comparisons.


> EVE
Found with 1207 comparisons.
E
V
E

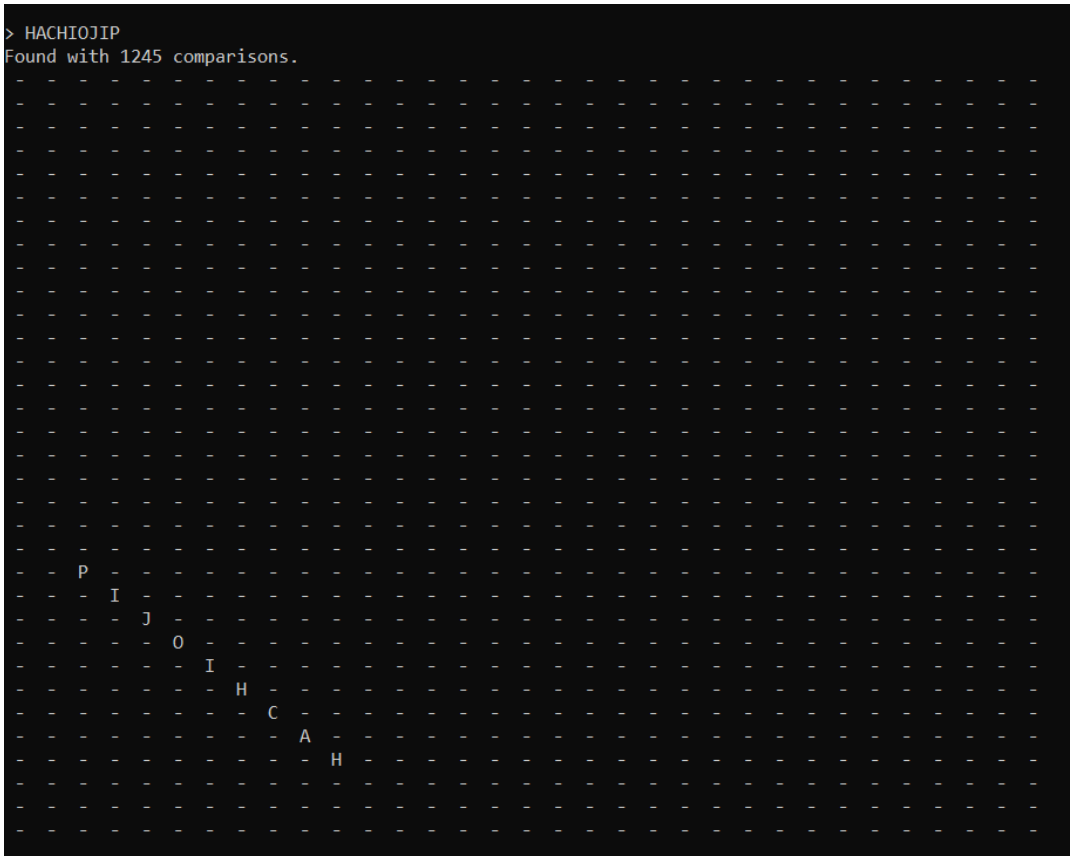

> HARUMAKIGOHAN
Found with 998 comparisons.
H A R U M A K I G O H A N

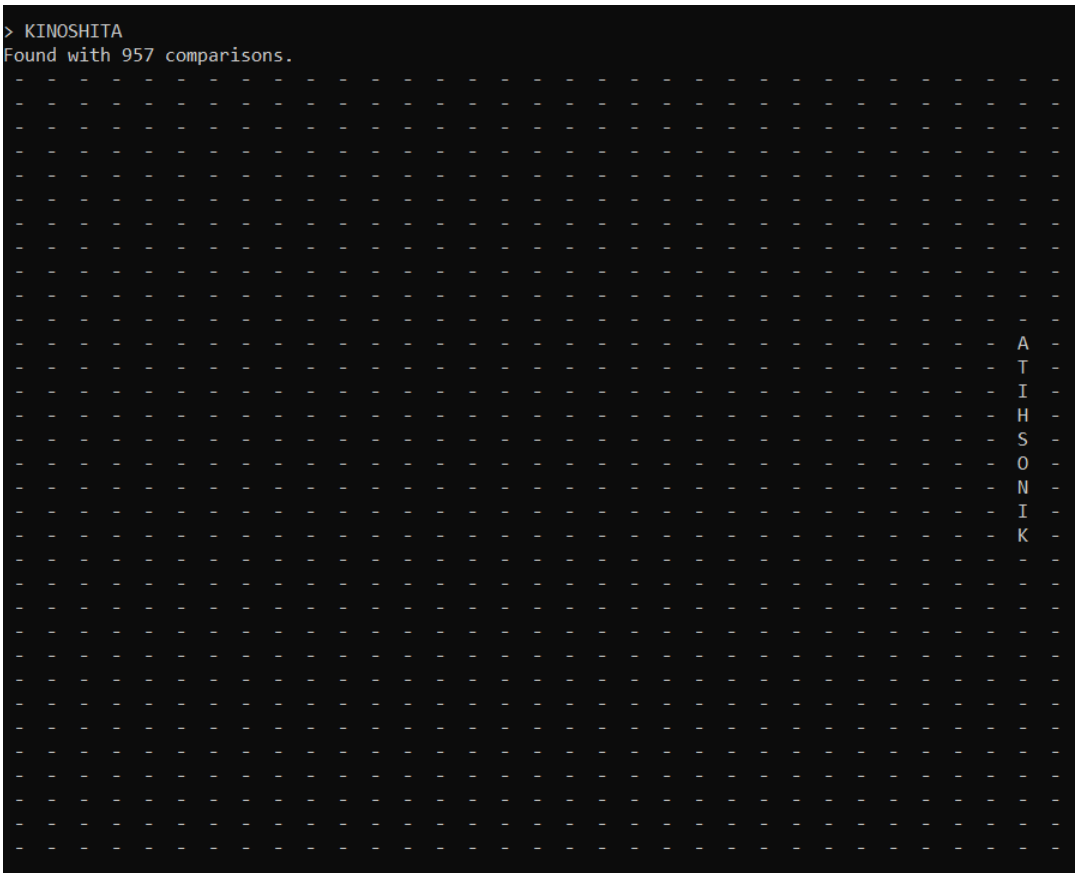

> INABAKUMORI
Found with 13 comparisons.

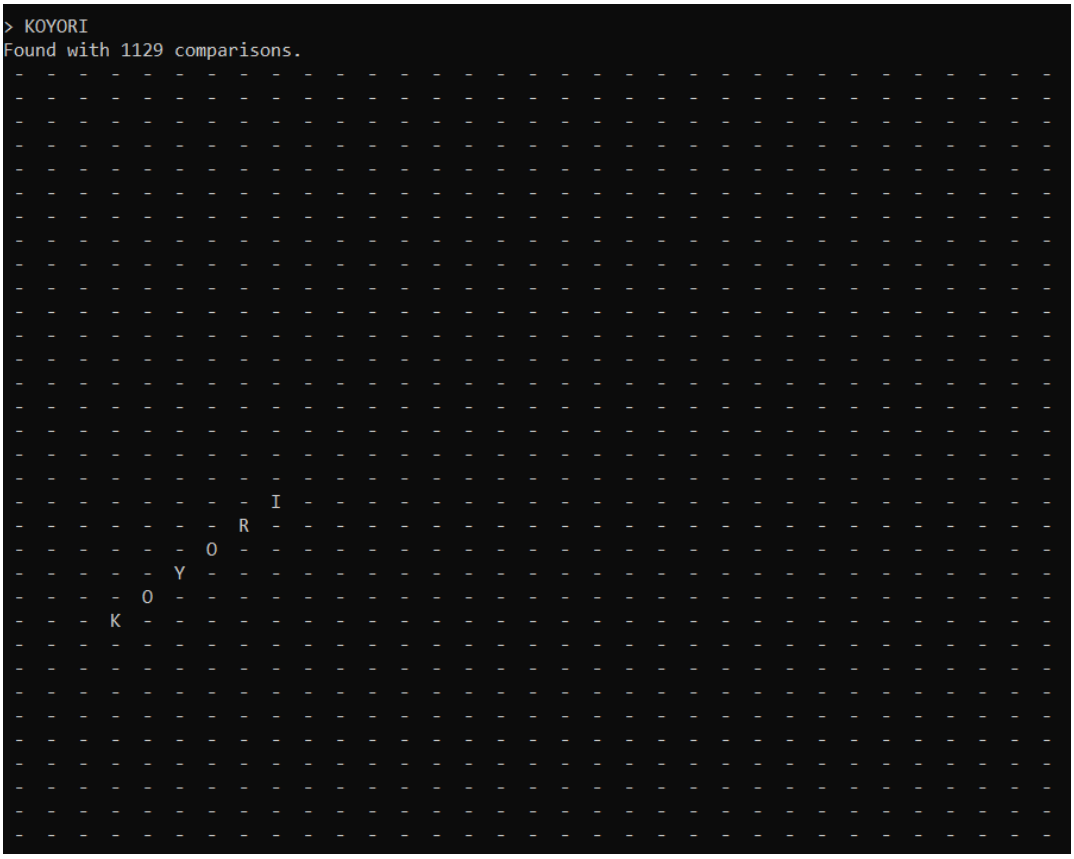

> KESANB
Found with 121 comparisons.


> KEMU
Found with 999 comparisons.
K
E
M
U


> LAMAZEP
Found with 622 comparisons.
P E Z A M A L

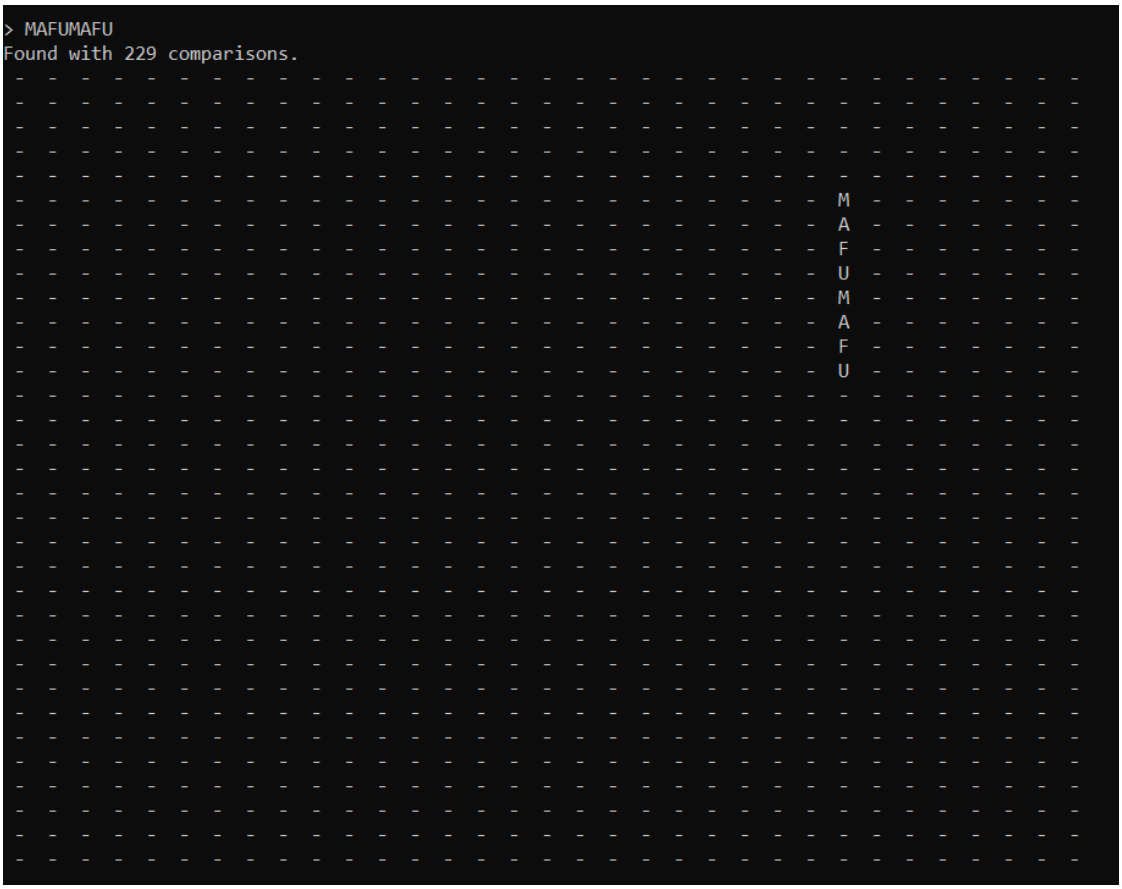

> HACHIOJIP
Found with 1245 comparisons.

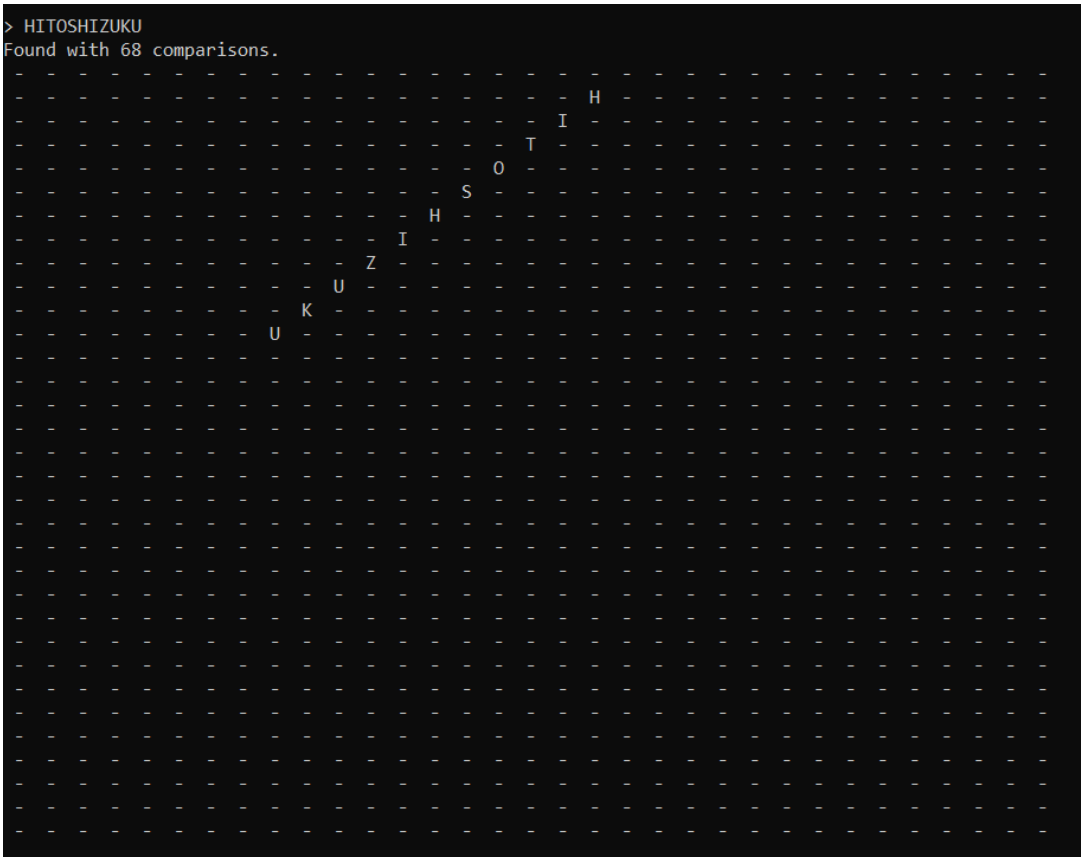

> KINOSHITA
Found with 957 comparisons.
ATHSONIK


> KOYORI
Found with 1129 comparisons.

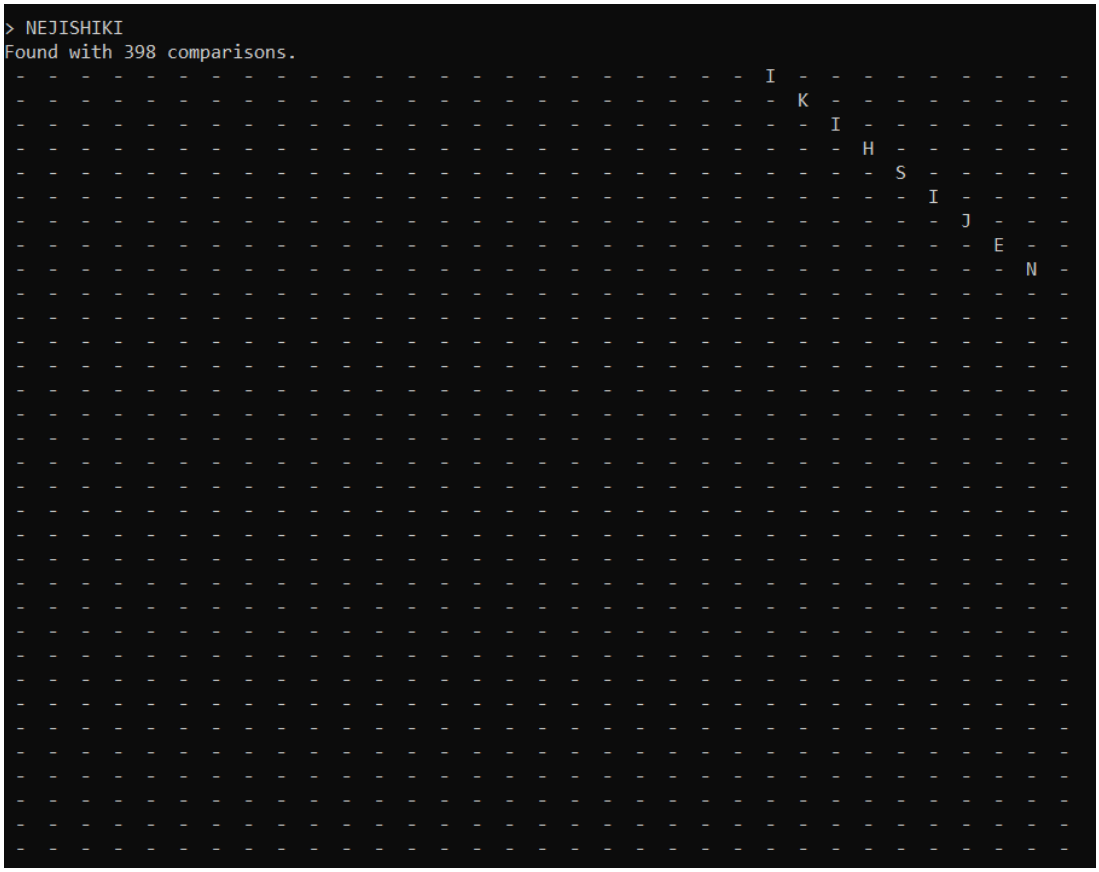

> KUROUSAP
Found with 274 comparisons.
K U R O U S A P


> LASTNOTE
Found with 29 comparisons.


> MAFUMAFU
Found with 229 comparisons.


> HITOSHIZUKU
Found with 68 comparisons.


> POLICEPICCADILLY
Found with 650 comparisons.


> NEJISHIKI
Found with 398 comparisons.


> AOTOKEI
Found with 790 comparisons.
I
E
K
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T
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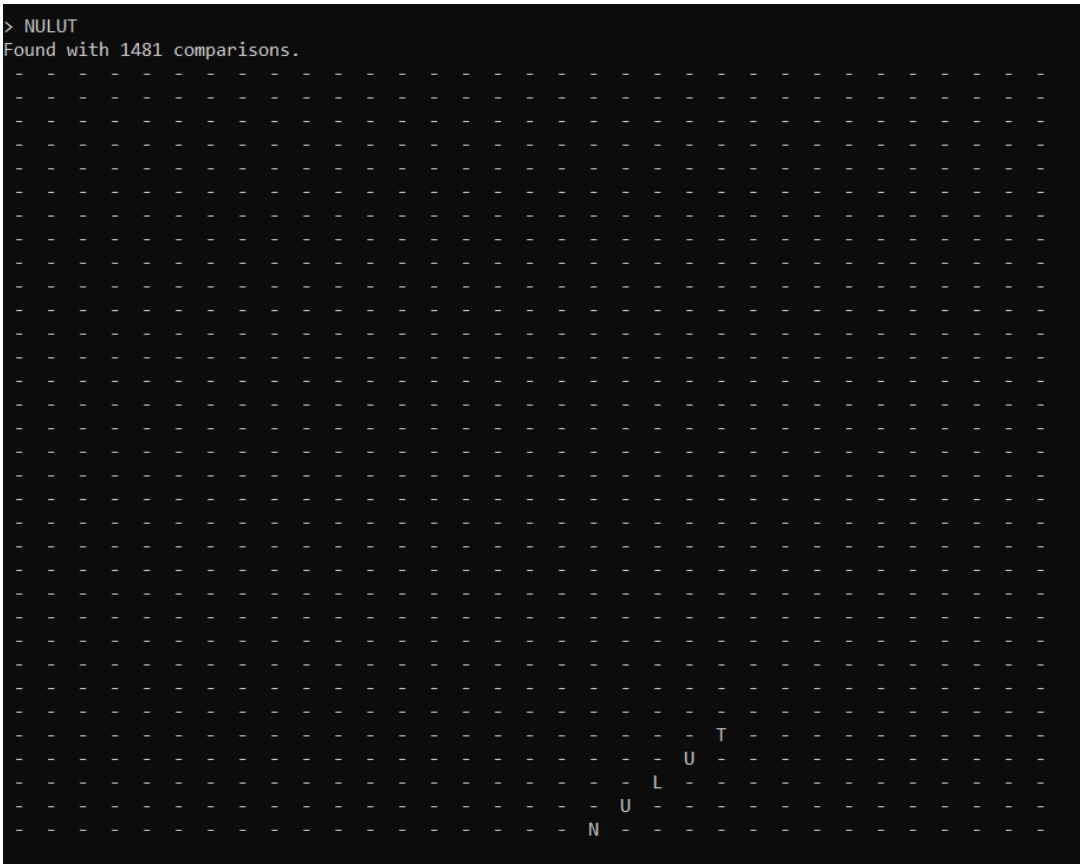
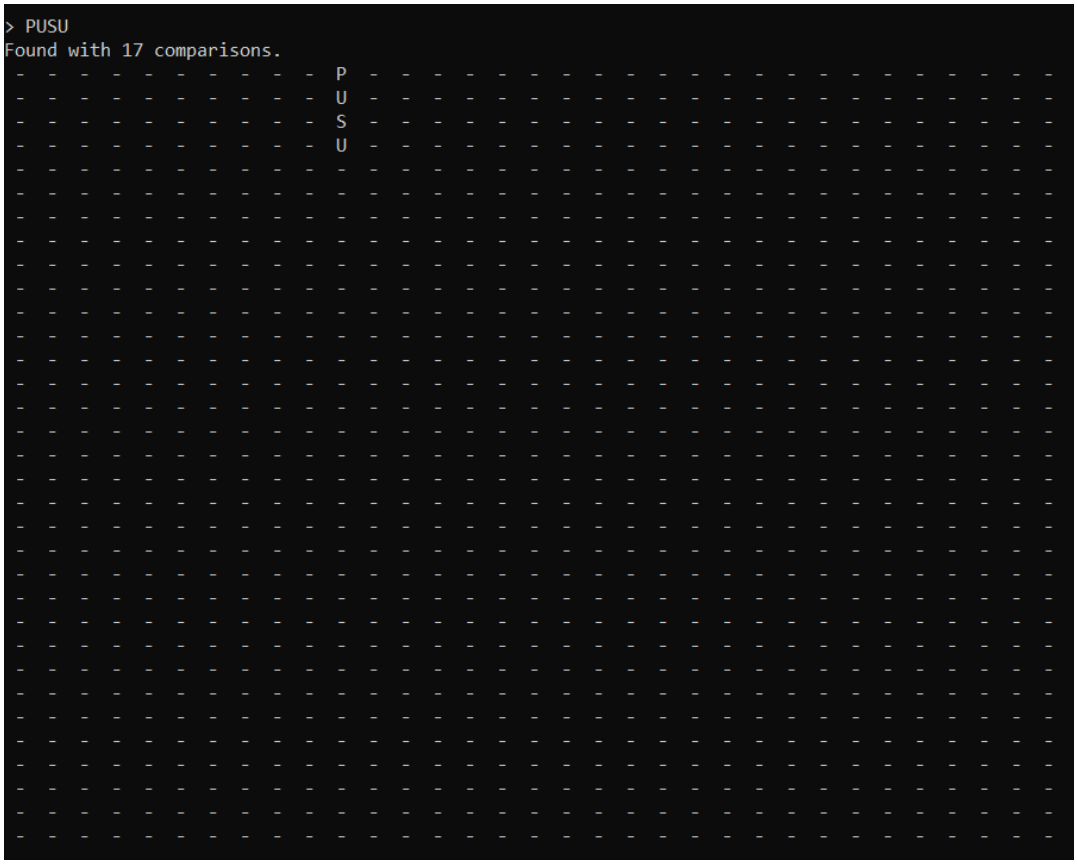
A

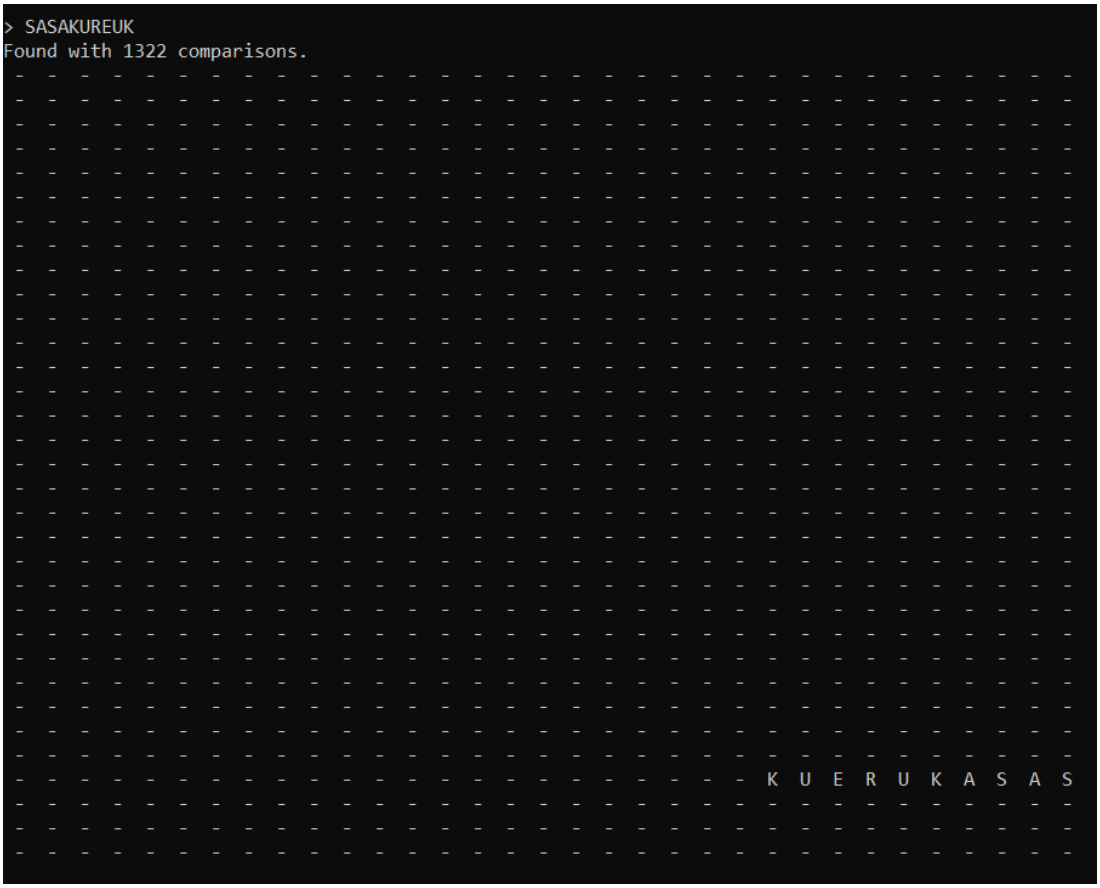

> NULUT
Found with 1481 comparisons.
T
U
L
U
N

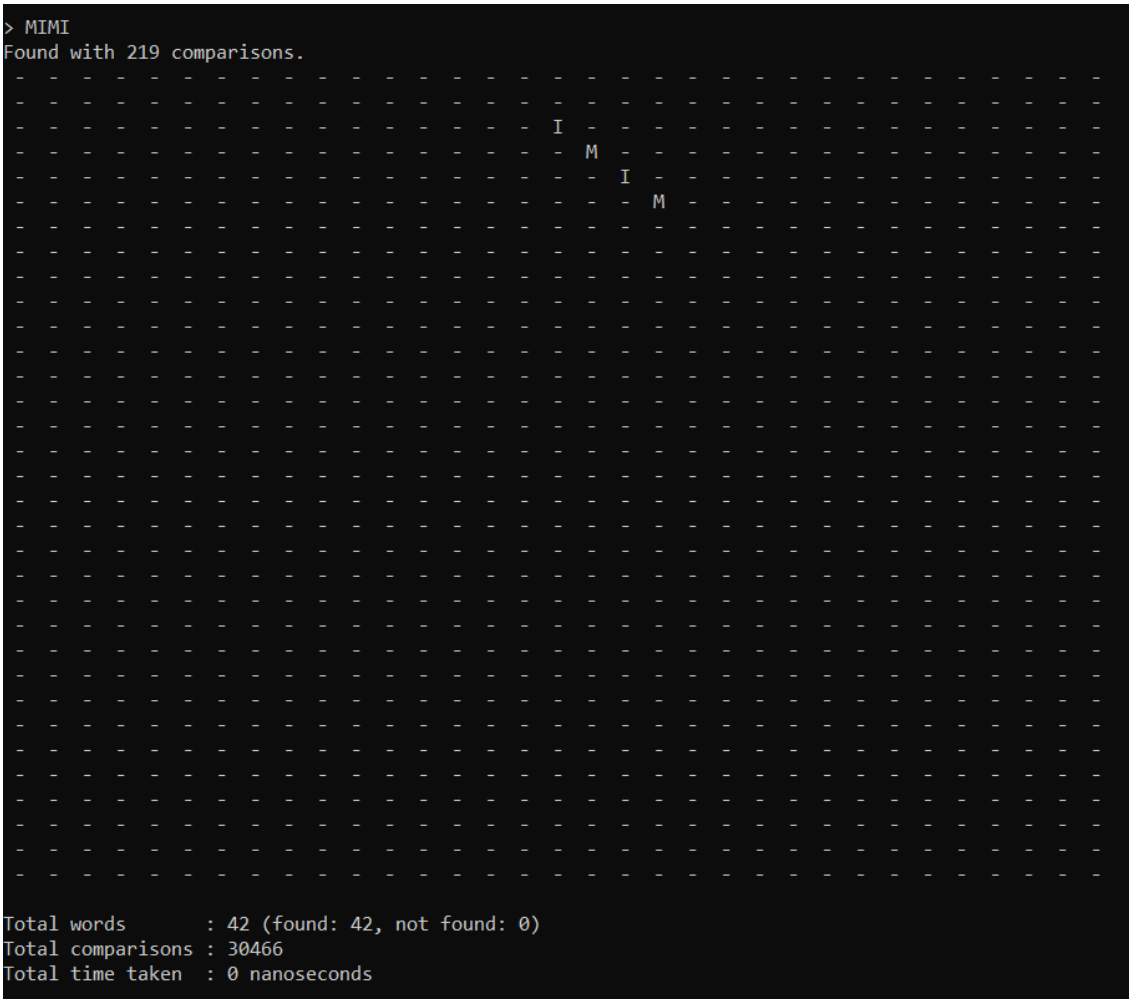

> ORANGESTAR
Found with 1160 comparisons.
O R A N G E S T A R


> RERULILI
Found with 463 comparisons.

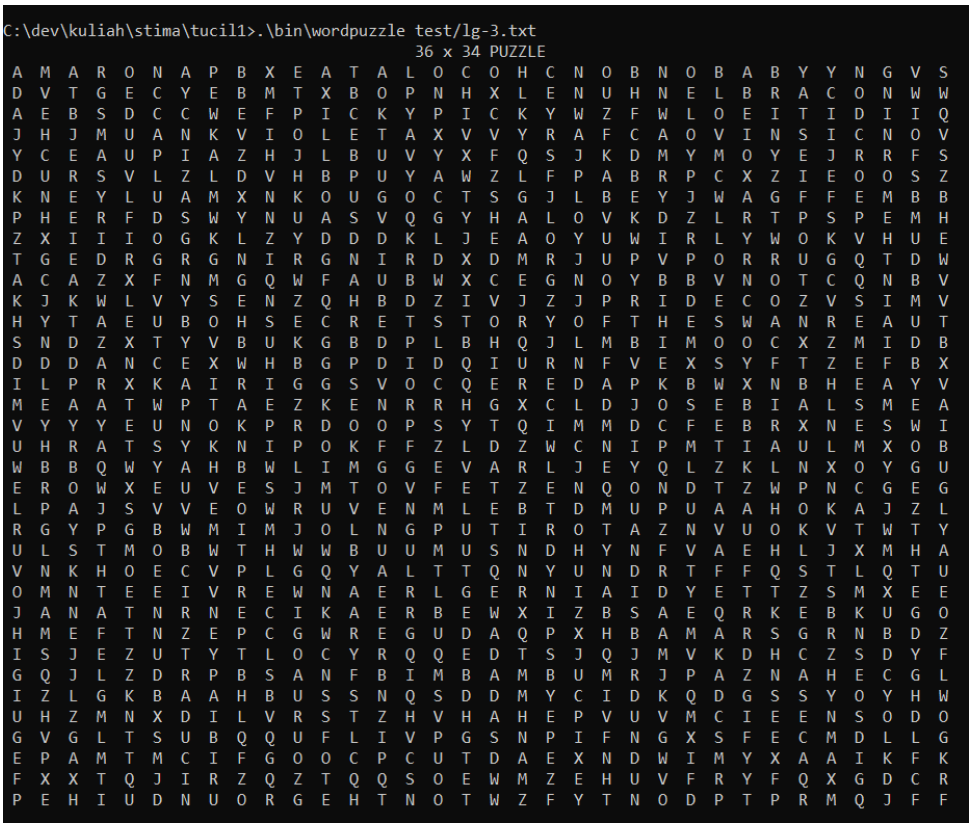

> PUSU
Found with 17 comparisons.

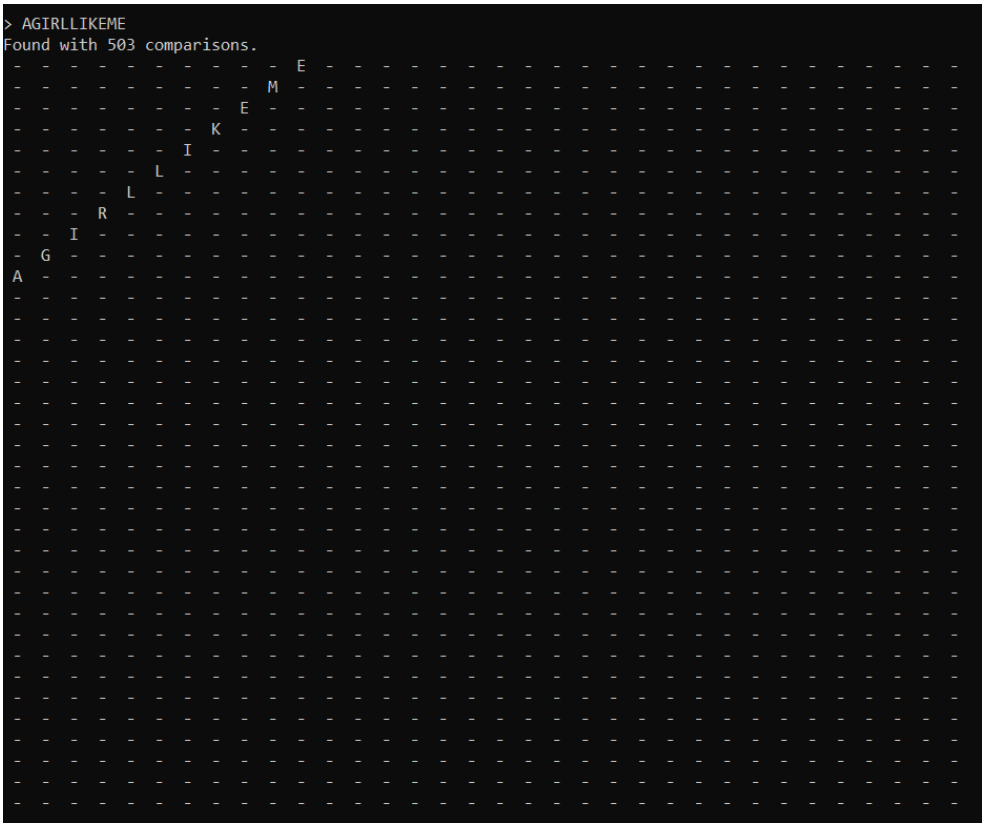

> AGOANIKIP
Found with 789 comparisons.

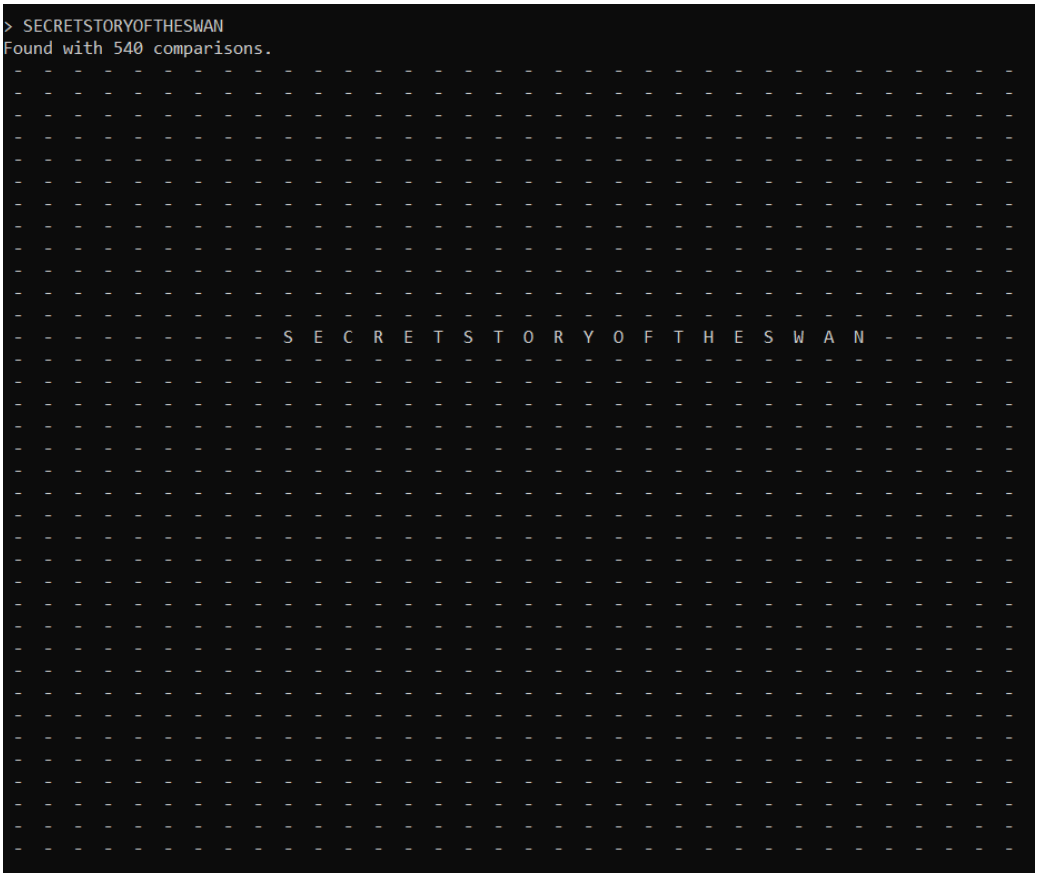

> SASAKUREUK
Found with 1322 comparisons.
K U E R U K A S A S


> MIMI
Found with 219 comparisons.
Total words : 42 (found: 42, not found: 0)
Total comparisons : 30466
Total time taken : 0 nanoseconds

I. lg-3.txt

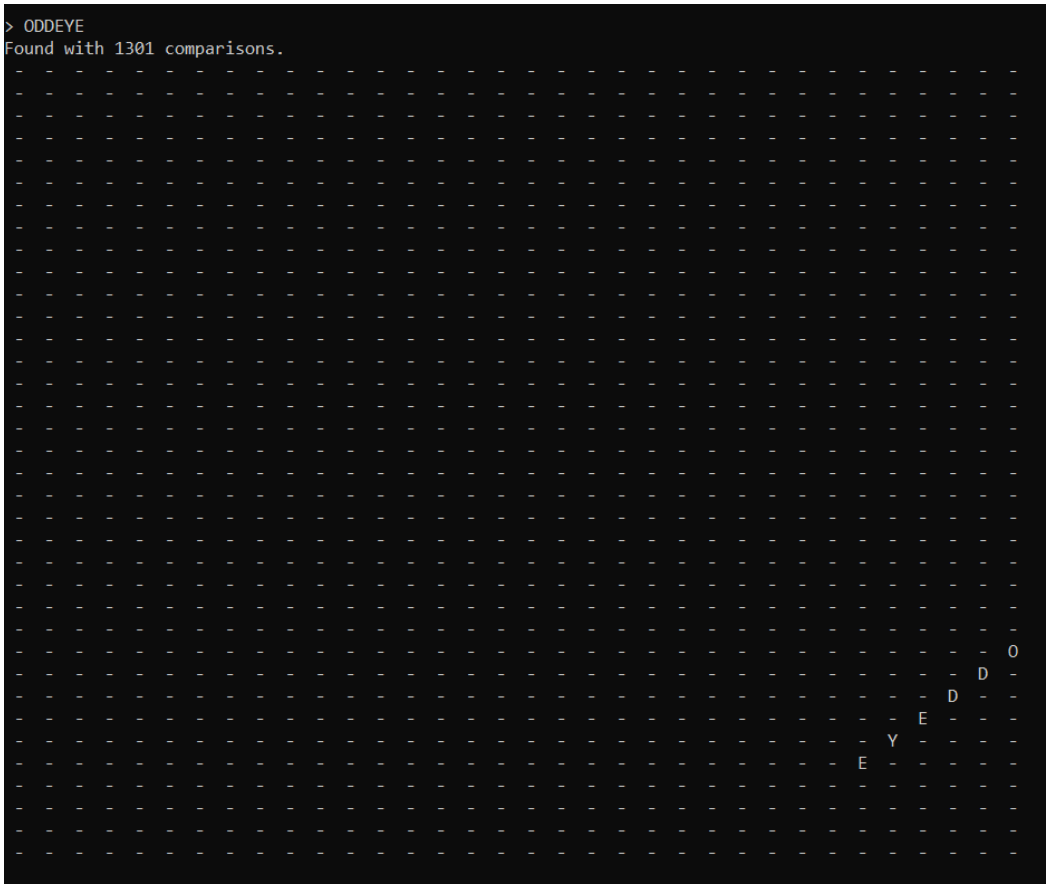

C:\dev\kuliah\stima\tucil1>.\bin\wordpuzzle test/lg-3.txt
36 x 34 PUZZLE
A M A R O N A P B X E A T A L O C O H C N O B N O B A B Y Y N G V S
D V T G E C Y E B M T X B O P N H X L E N U H N E L B R A C O N W W
A E B S D C C W E F P I C K Y P I C K Y W Z F W L O E I T I D I I Q
J H J M U A N K V I O L E T A X V V Y R A F C A O V I N S I C N O V
Y C E A U P I A Z H J L B U V Y X F Q S J K D M Y M O Y E J R R F S
D U R S V L Z L D V H B P U Y A W Z L F P A B R P C X Z I E O O S Z
K N E Y L U A M X N K O U G O C T S G J L B E Y J W A G F F E M B B
P H E R F D S W Y N U A S V Q G Y H A L O V K D Z L R T P S P E M H
Z X I I I O G K L Z Y D D D K L J E A O Y U W I R L Y W O K V H U E
T G E D R G R G N I R G N I R D X D M R J U P V P O R R U G Q T D W
A C A Z X F N M G Q W F A U B W X C E G N O Y B B V N O T C Q N B V
K J K W L V Y S E N Z Q H B D Z I V J Z J P R I D E C O Z V S I M V
H Y T A E U B O H S E C R E T S T O R Y O F T H E S W A N R E A U T
S N D Z X T Y V B U K G B D P L B H Q J L M B I M O O C X Z M I D B
D D D A N C E X W H B G P D I D Q I U R N F V E X S Y F T Z E F B X
I L P R X K A I R I G G S V O C Q E R E D A P K B W X N B H E A Y V
M E A A T W P T A E Z K E N R R H G X C L D J O S E B I A L S M E A
V Y Y Y E U N O K P R D O O P S Y T Q I M M D C F E B R X N E S W I
U H R A T S Y K N I P O K F F Z L D Z W C N I P M T I A U L M X O B
W B B Q W Y A H B W L I M G G E V A R L J E Y Q L Z K L N X O Y G U
E R O W X E U V E S J M T O V F E T Z E N Q O N D T Z W P N C G E G
L P A J S V V E O W R U V E N M L E B T D M U P U A A H O K A J Z L
R G Y P G B W M I M J O L N G P U T I R O T A Z N V U O K V T W T Y
U L S T M O B W T H W W B U U M U S N D H Y N F V A E H L J X M H A
V N K H O E C V P L G Q Y A L T T Q N Y U N D R T F F Q S T L Q T U
O M N T E E I V R E W N A E R L G E R N I A I D Y E T T Z S M X E E
J A N A T N R N E C I K A E R B E W X I Z B S A E Q R K E B K U G O
H M E F T N Z E P C G W R E G U D A Q P X H B A M A R S G R N B D Z
I S J E Z U T Y T L O C Y R Q Q E D T S J Q J M V K D H C Z S D Y F
G Q J L Z D R P B S A N F B I M B A M B U M R J P A Z N A H E C G L
I Z L G K B A A H B U S S N Q S D D M Y C I D K Q D G S S Y O Y H W
U H Z M N X D I L V R S T Z H V H A H E P V U V M C I E E N S O D O
G V G L T S U B Q Q U F L I V P G S N P I F N G X S F E C M D L L G
E P A M T M C I F G O O C P C U T D A E X N D W I M Y X A A I K F K
F X X T Q J I R Z Q Z T Q Q S O E W M Z E H U V F R Y F Q X G D C R
P E H I U D N U O R G E H T N O T W Z F Y T N O D P T P R M Q J F F

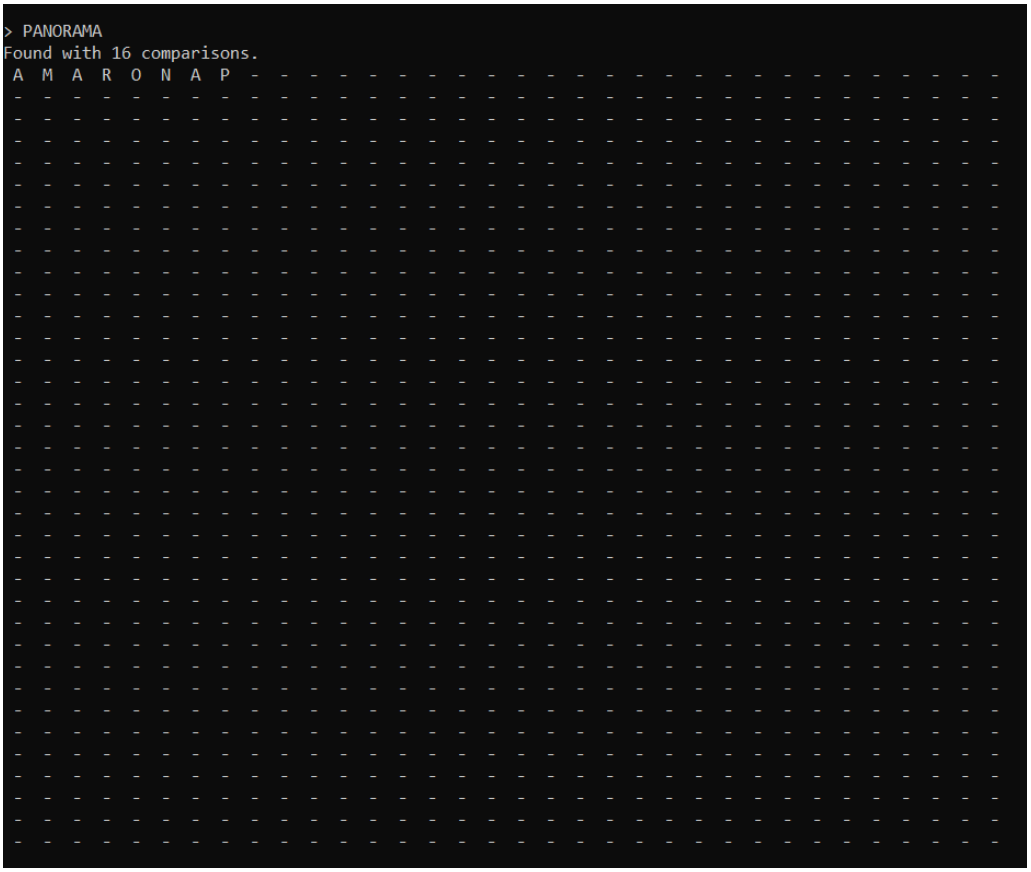

> AGIRLLIKEME
Found with 503 comparisons.


> SECRETSTORYOFTHESWAN
Found with 540 comparisons.
S E C R E T S T O R Y O F T H E S W A N

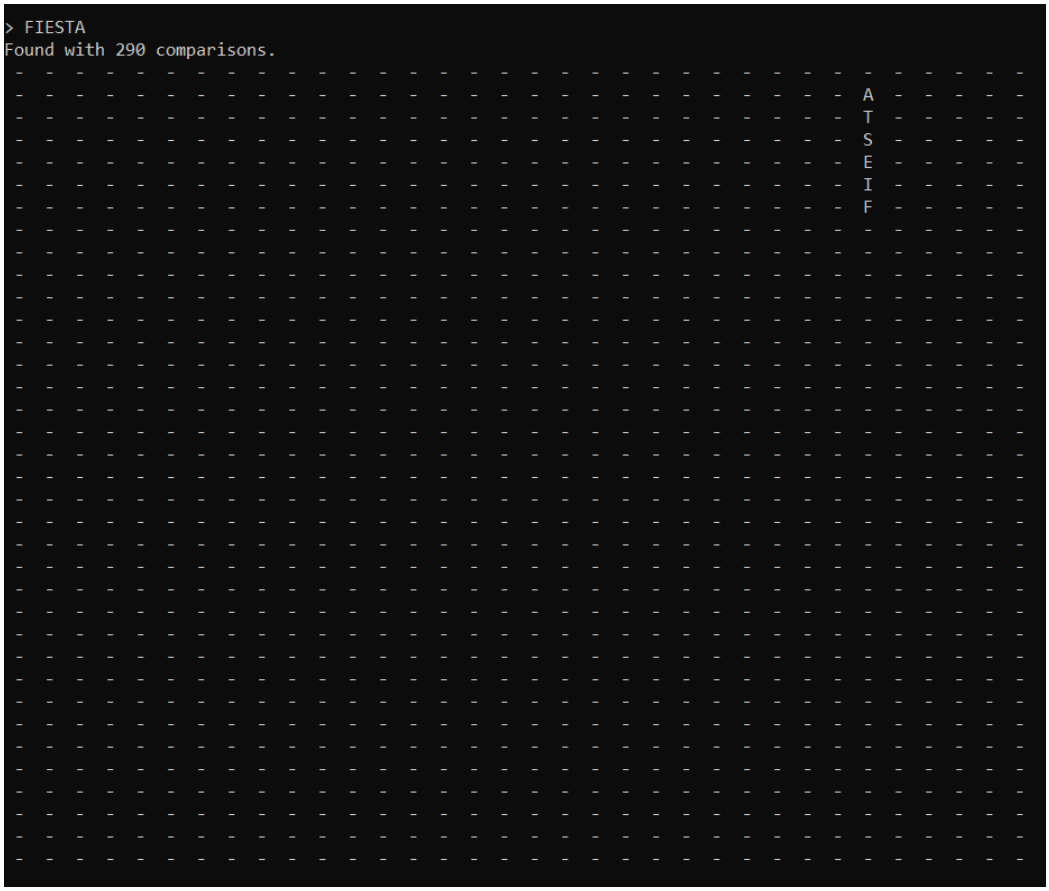

> CRYFORME
Found with 225 comparisons.
C
R
Y
F
O
R
M
E

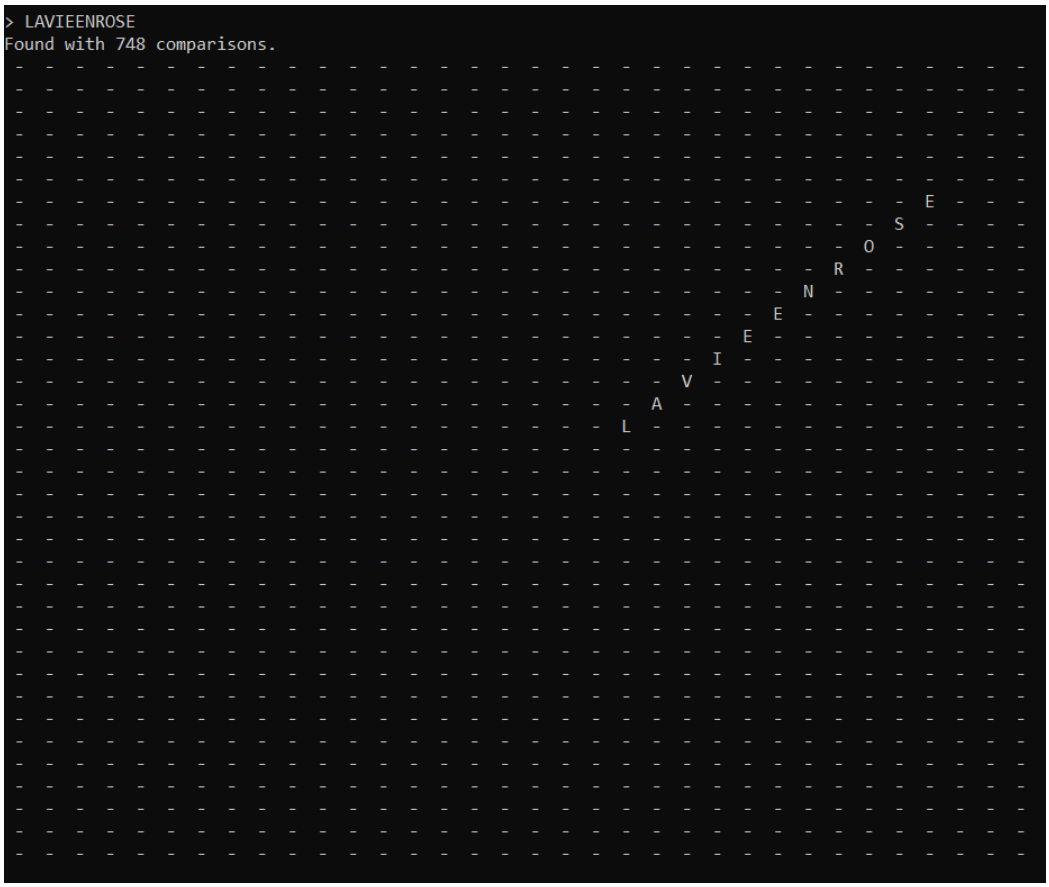

> LOVESOSWEET
Found with 439 comparisons.
L
O
V
E
S
O
S
W
E
E
T

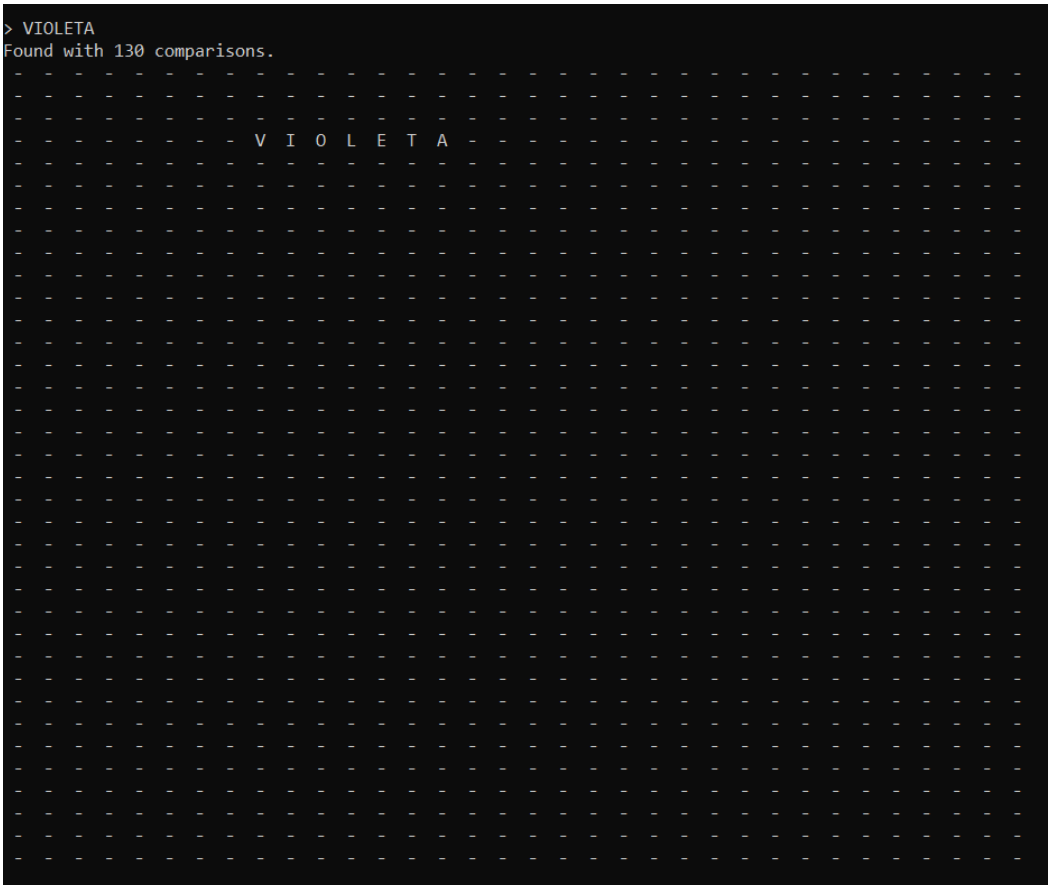

> ODDEYE
Found with 1301 comparisons.
O
D
D
E
Y
E

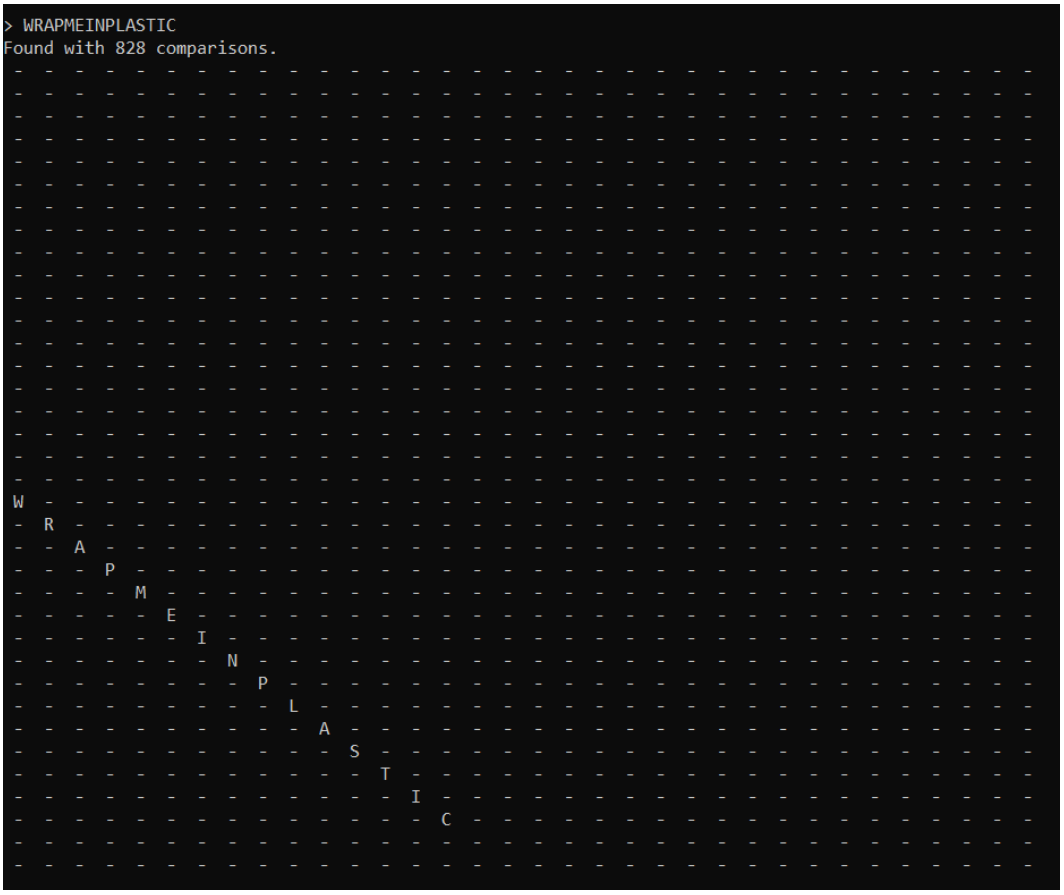

> PANORAMA
Found with 16 comparisons.
A M A R O N A P


> PSYCHO
Found with 248 comparisons.
O
H
C
Y
S
P


> FIESTA
Found with 290 comparisons.
A
T
S
E
I
F


> LAVIEENROSE
Found with 748 comparisons.
E
S
O
R
N
E
E
I
V
A
L

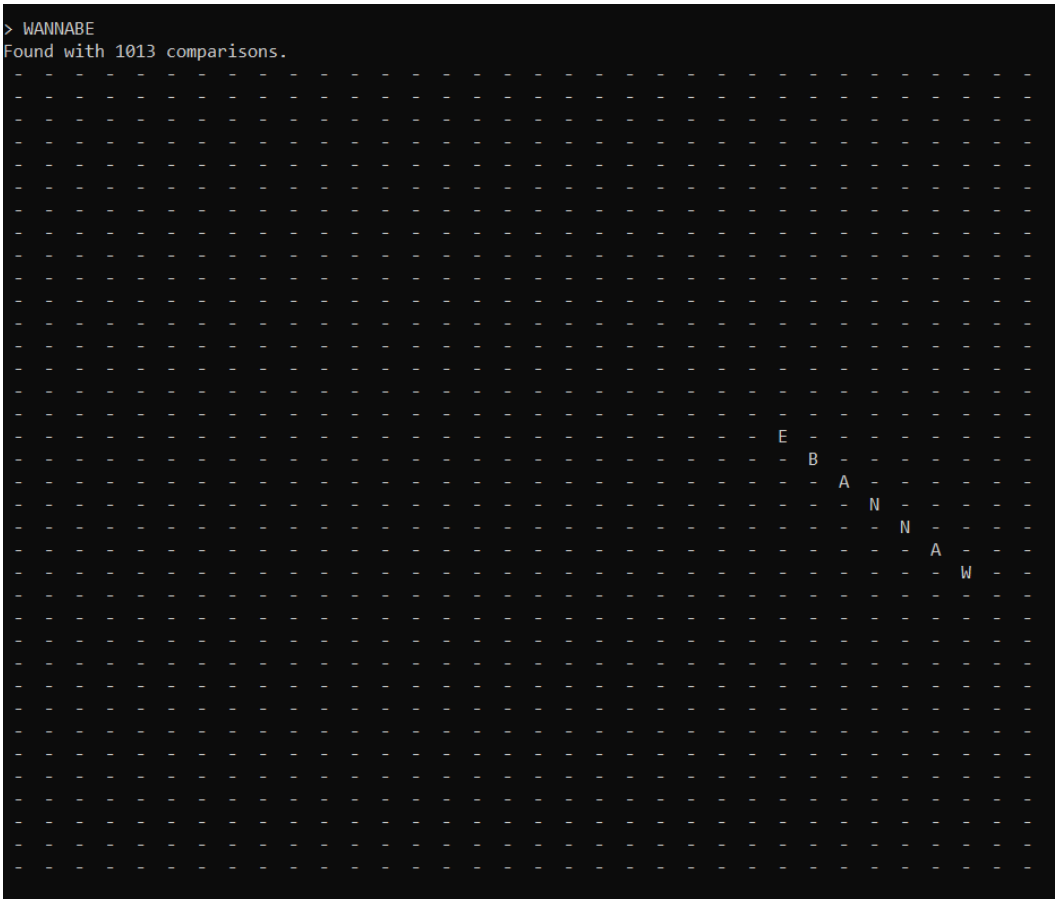

> VIOLETA
Found with 130 comparisons.

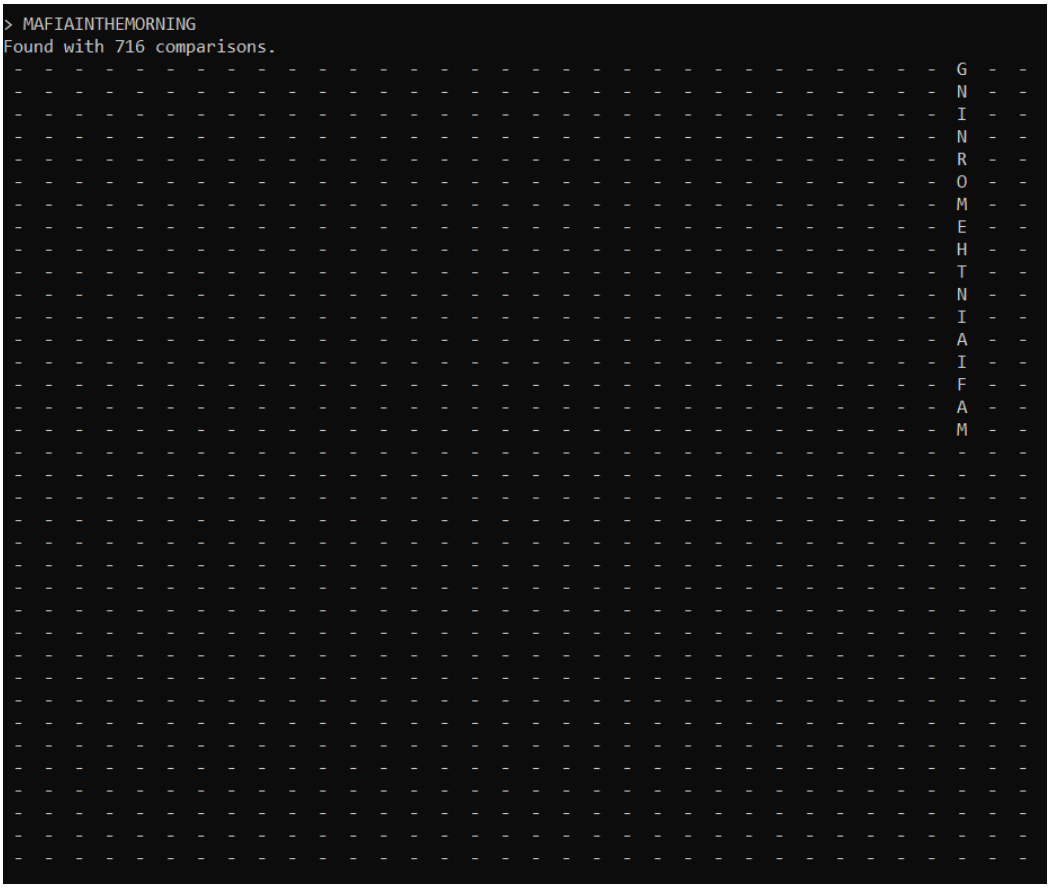

> WRAPMEINPLASTIC
Found with 828 comparisons.

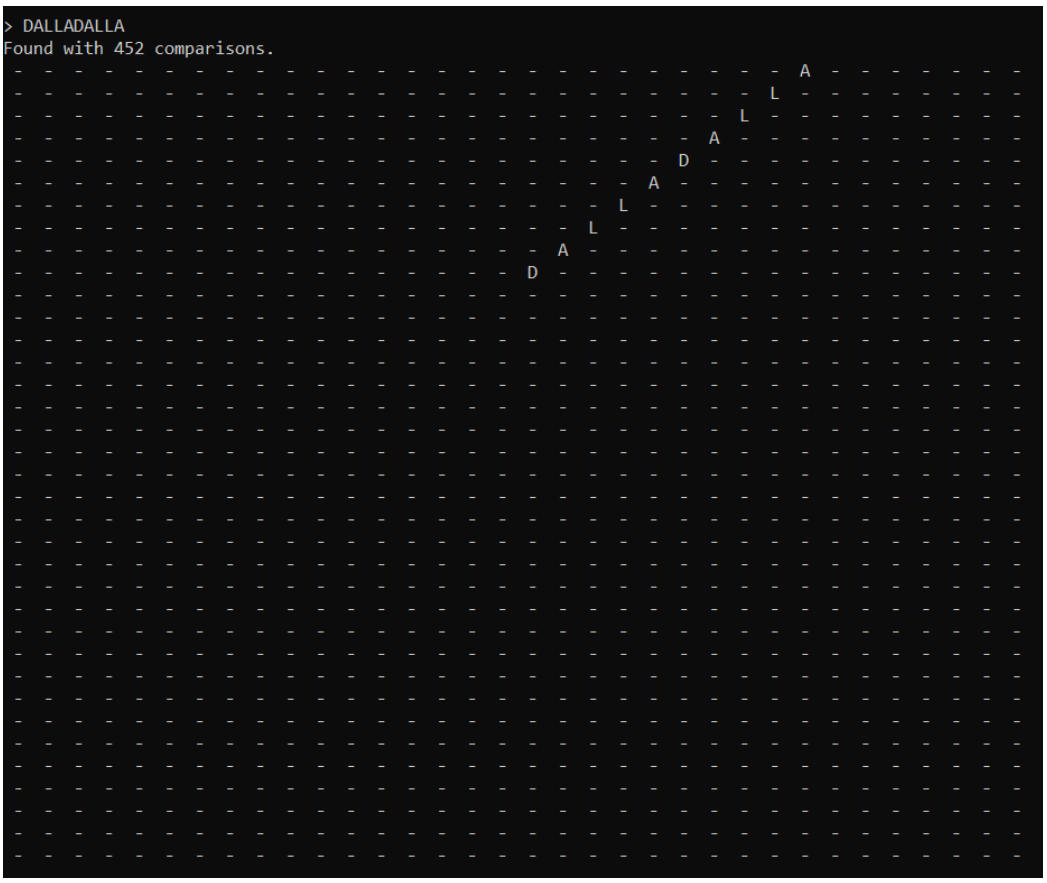

> DUNDUN
Found with 522 comparisons.

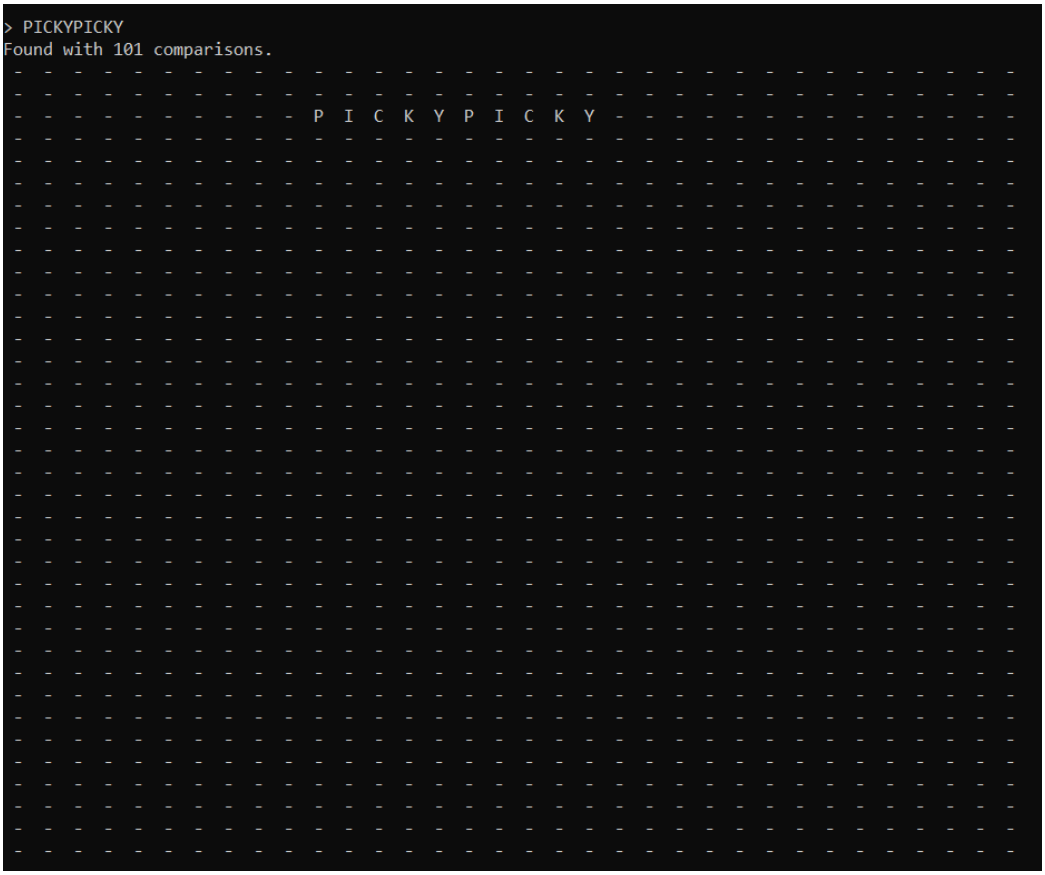

> LADIDA
Found with 247 comparisons.

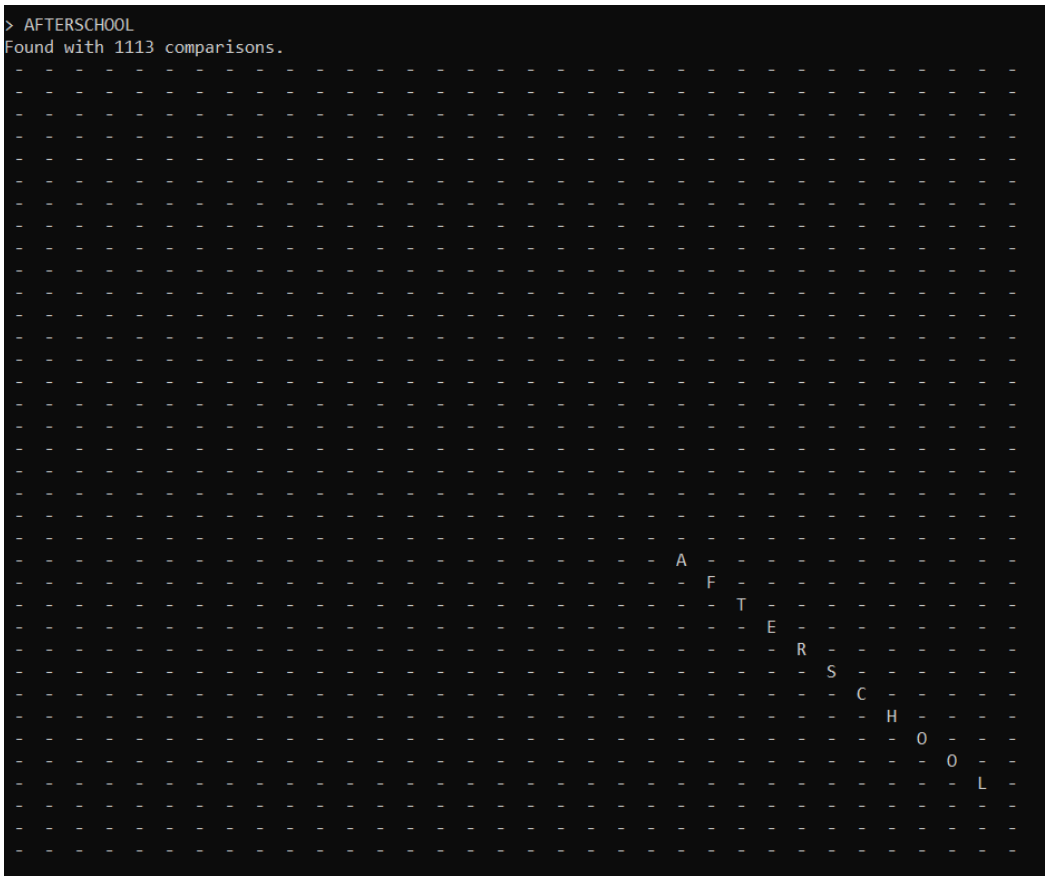

> BONBONCHOCOLAT
Found with 52 comparisons.


> WANNABE
Found with 1013 comparisons.

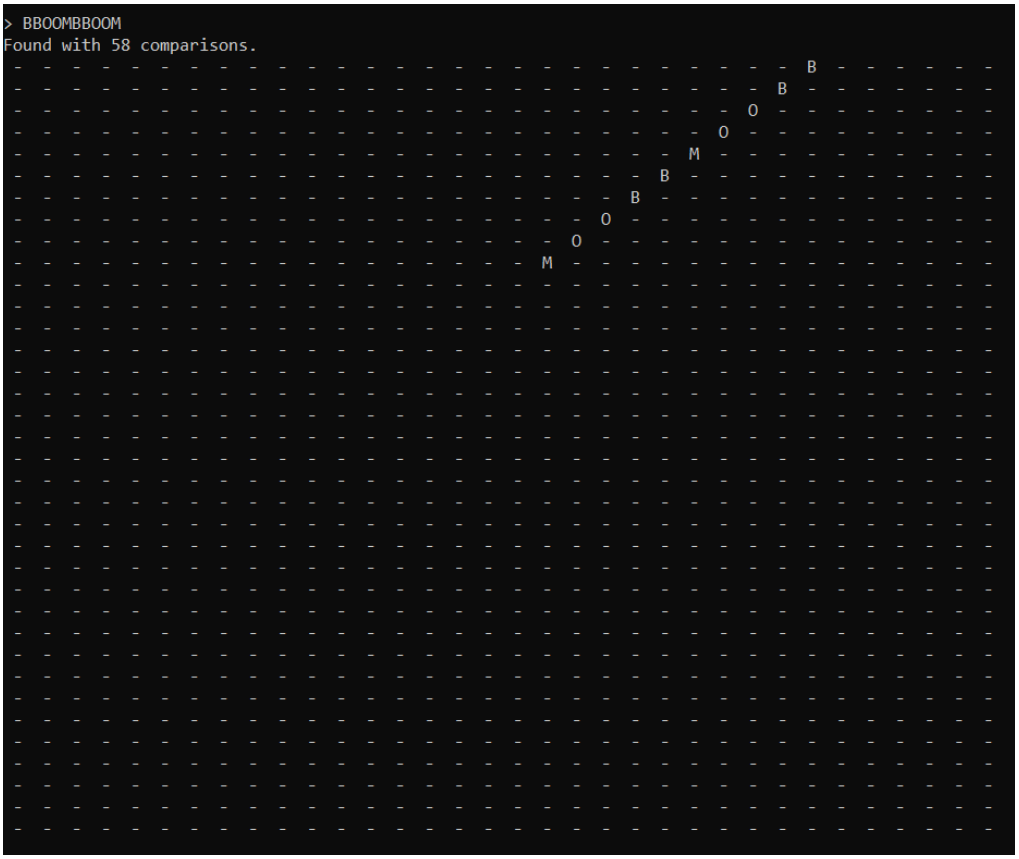

> MAFIAINTHEMORNING
Found with 716 comparisons.
G
N
I
N
R
O
M
E
H
T
N
I
A
I
F
A
M


> DALLADALLA
Found with 452 comparisons.
A
L
L
A
D
A
L
L
A
D

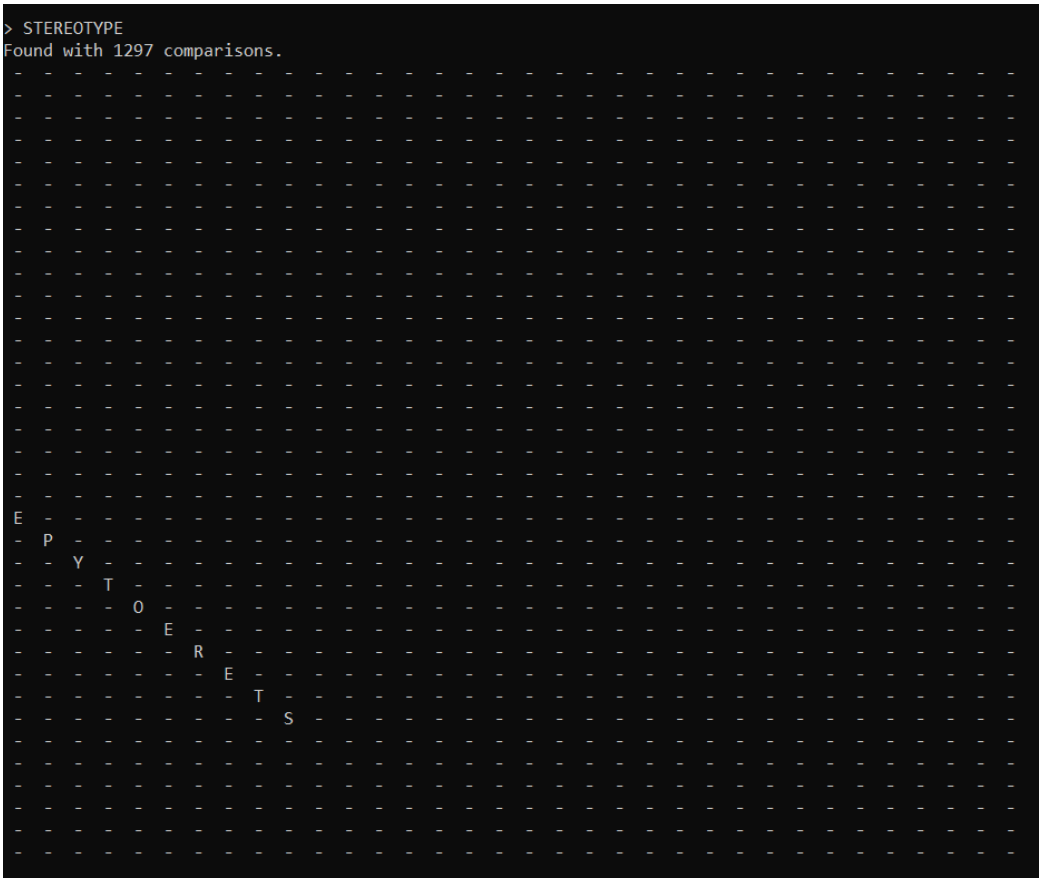

> PICKYPICKY
Found with 101 comparisons.
P I C K Y P I C K Y


> AFTERSCHOOL
Found with 1113 comparisons.
A
F
T
E
R
S
C
H
O
O
L

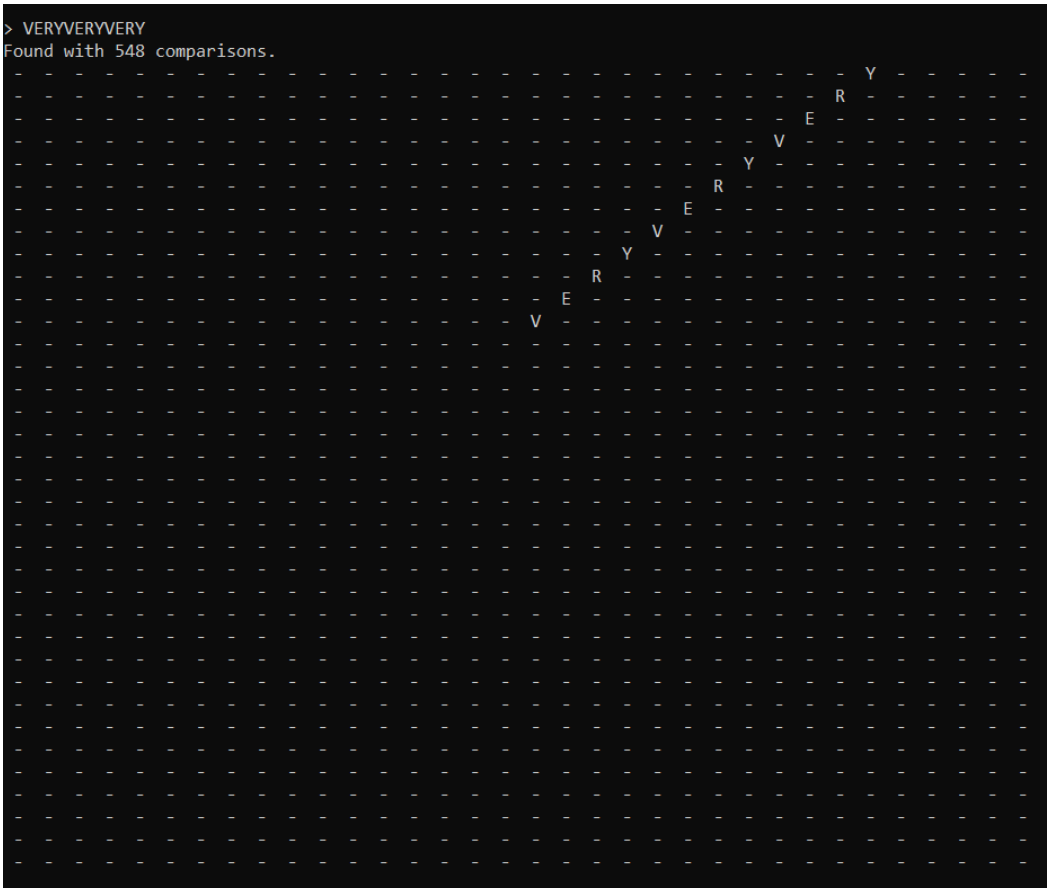

> WEEWOO
Found with 847 comparisons.


> BBOOMBBOOM
Found with 58 comparisons.

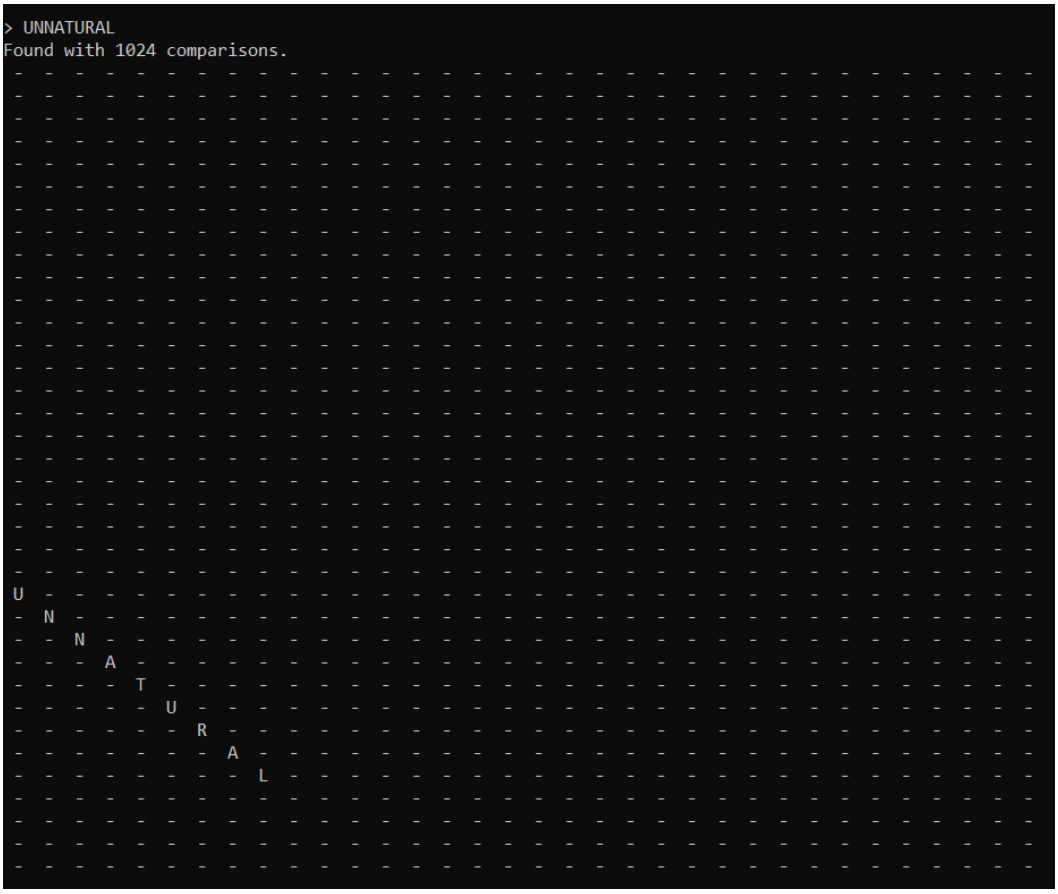

> PINKYSTAR
Found with 803 comparisons.
R A T S Y K N I P

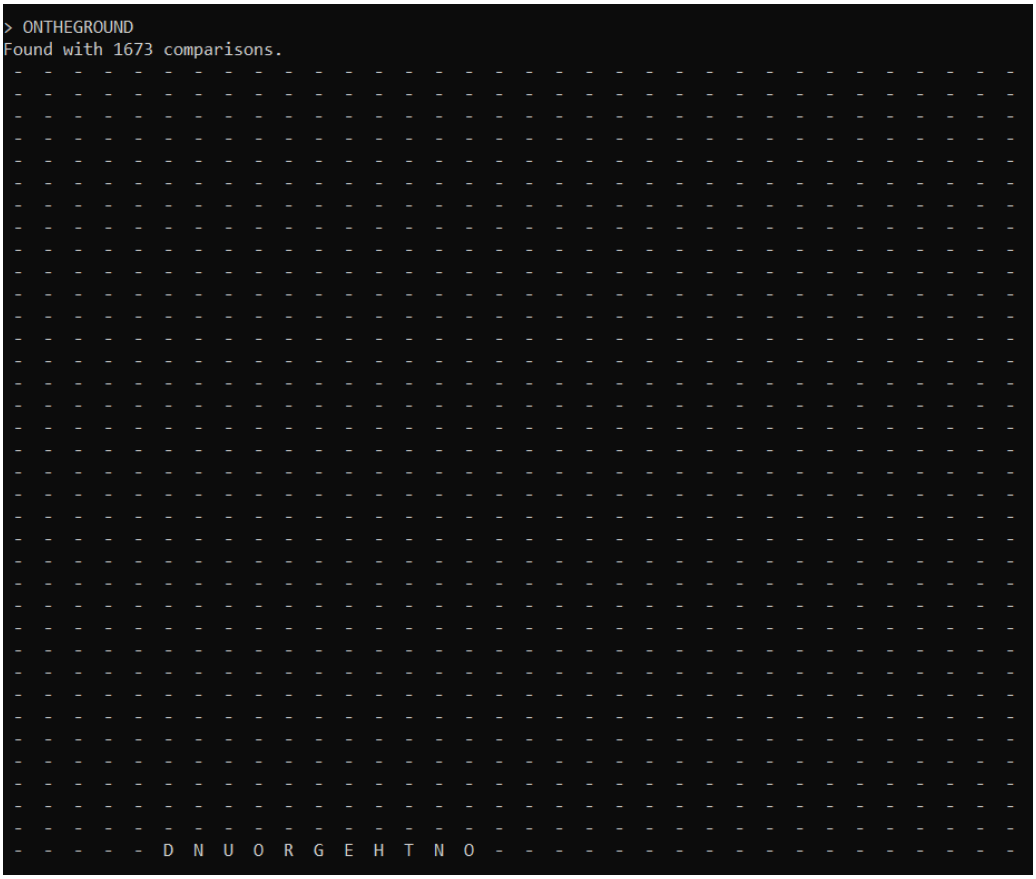

> STEREOTYPE
Found with 1297 comparisons.
E
P
Y
T
O
E
R
E
T
S

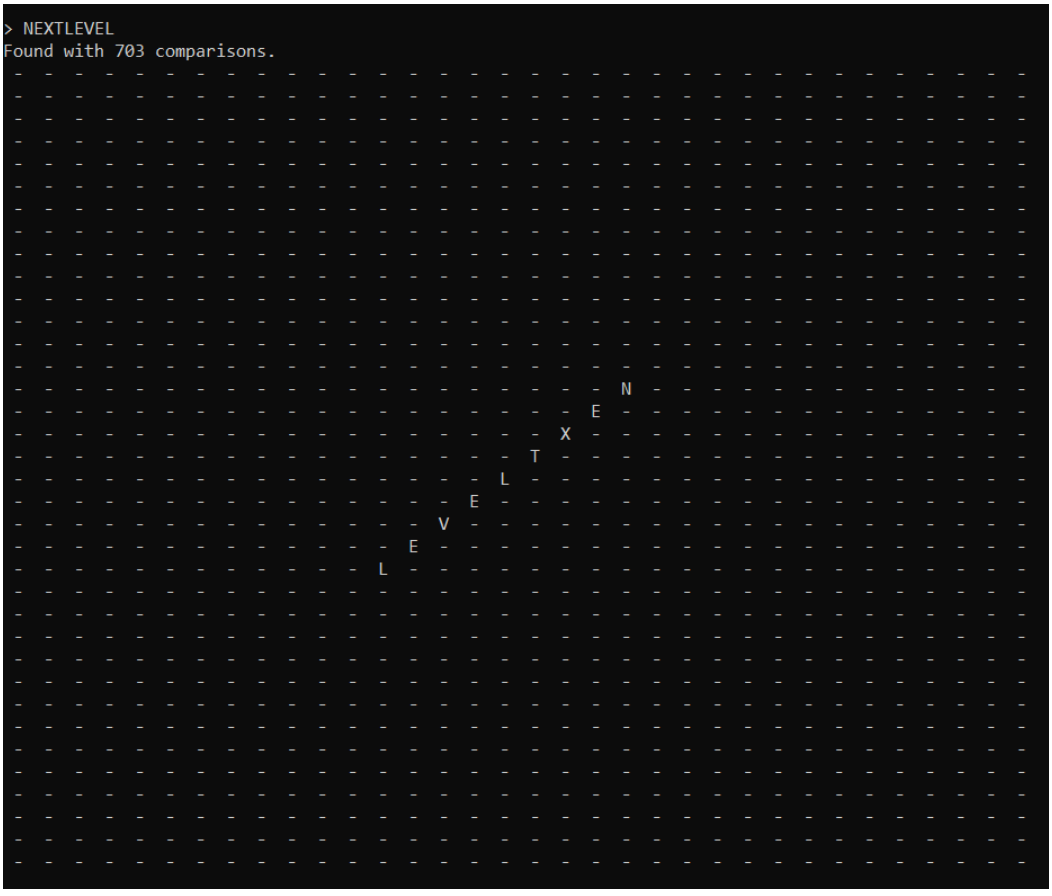

> COMESEEME
Found with 919 comparisons.
E
M
E
E
S
E
M
O
C


> VERYVERYVERY
Found with 548 comparisons.
Y
R
E
V
Y
R
E
V
Y
R
E
V


> DDDANCE
Found with 646 comparisons.

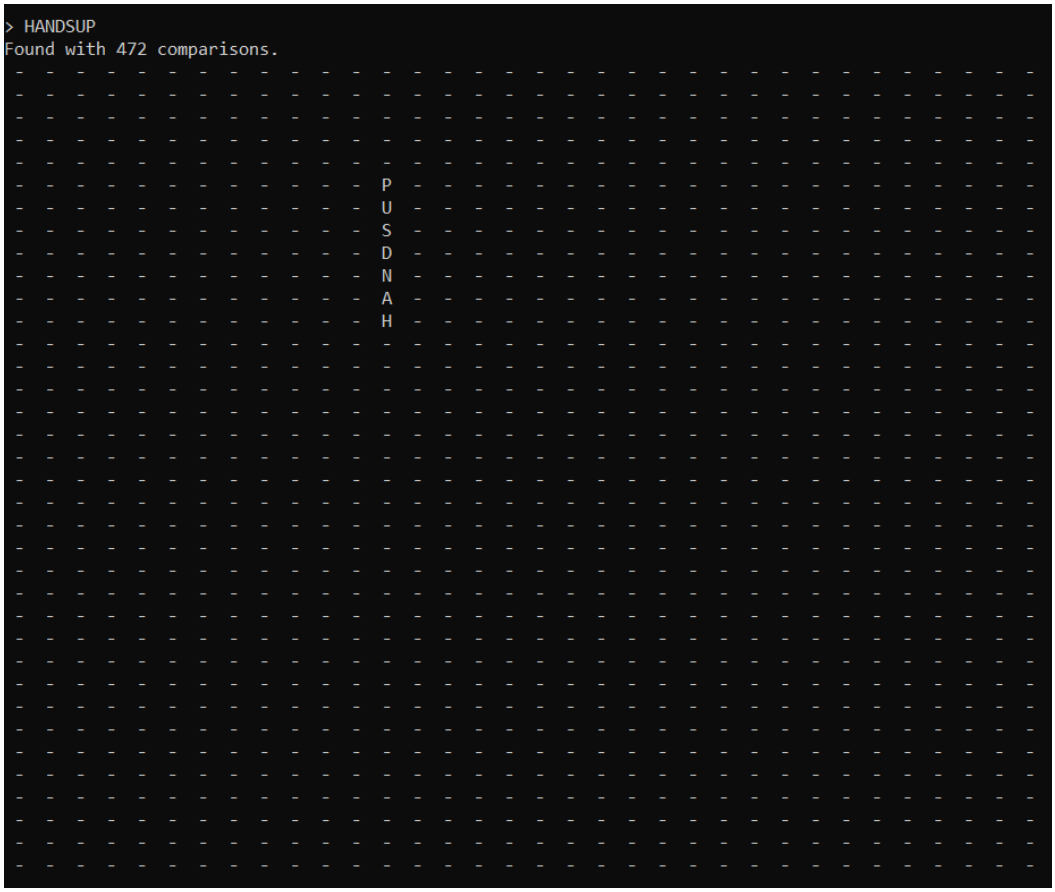

> UNNATURAL
Found with 1024 comparisons.


> ONTHEGROUND
Found with 1673 comparisons.
D N U O R G E H T N O


> NEXTLEVEL
Found with 703 comparisons.

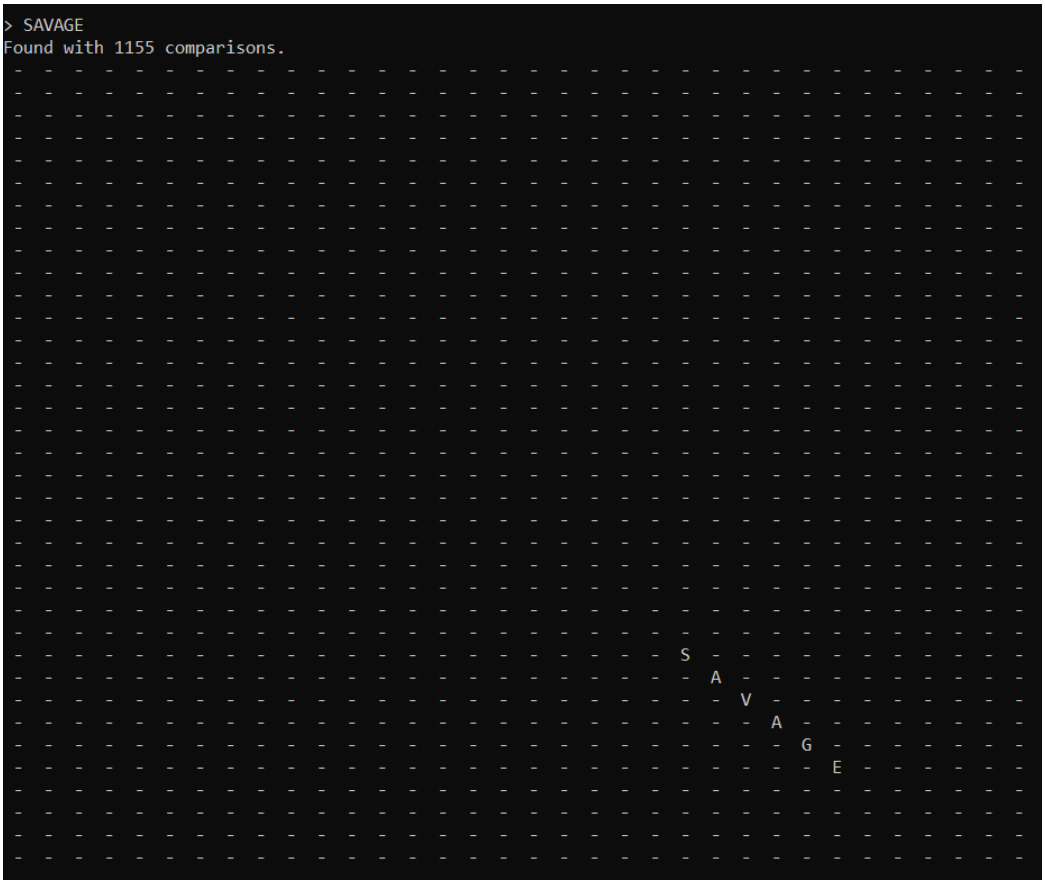

> BREAKICE
Found with 1213 comparisons.
E C I K A E R B


> UPNOMORE
Found with 1064 comparisons.
E
R
O
M
O
N
P
U


> HANDSUP
Found with 472 comparisons.
P
U
S
D
N
A
H


> QUEENDOM
Found with 1139 comparisons.
M
O
D
N
E
E
U
Q


> SWIPE
Found with 889 comparisons.
E
P
I
W
S

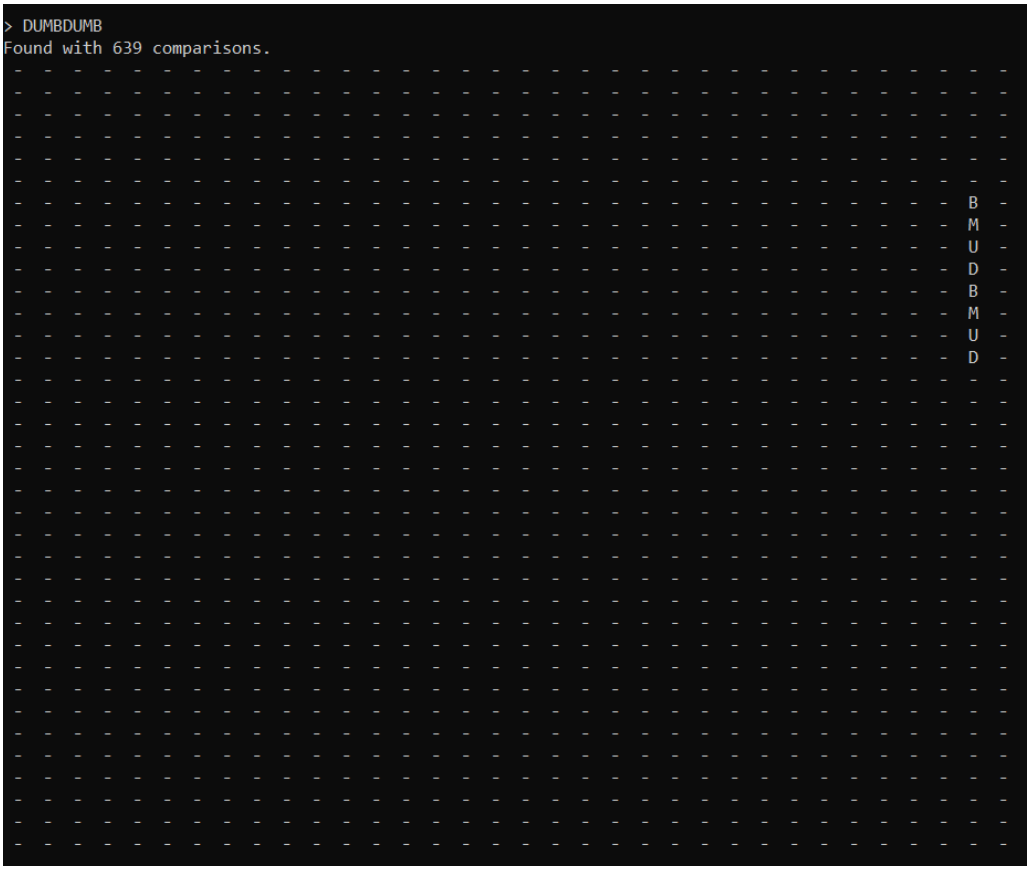

> SAVAGE
Found with 1155 comparisons.
S
A
V
A
G
E


> WADADA
Found with 1169 comparisons.
W
A
D
A
D
A


> SCIENTIST
Found with 726 comparisons.
S
C
I
E
N
T
I
S
T


> RINGRING
Found with 443 comparisons.
G N I R G N I R

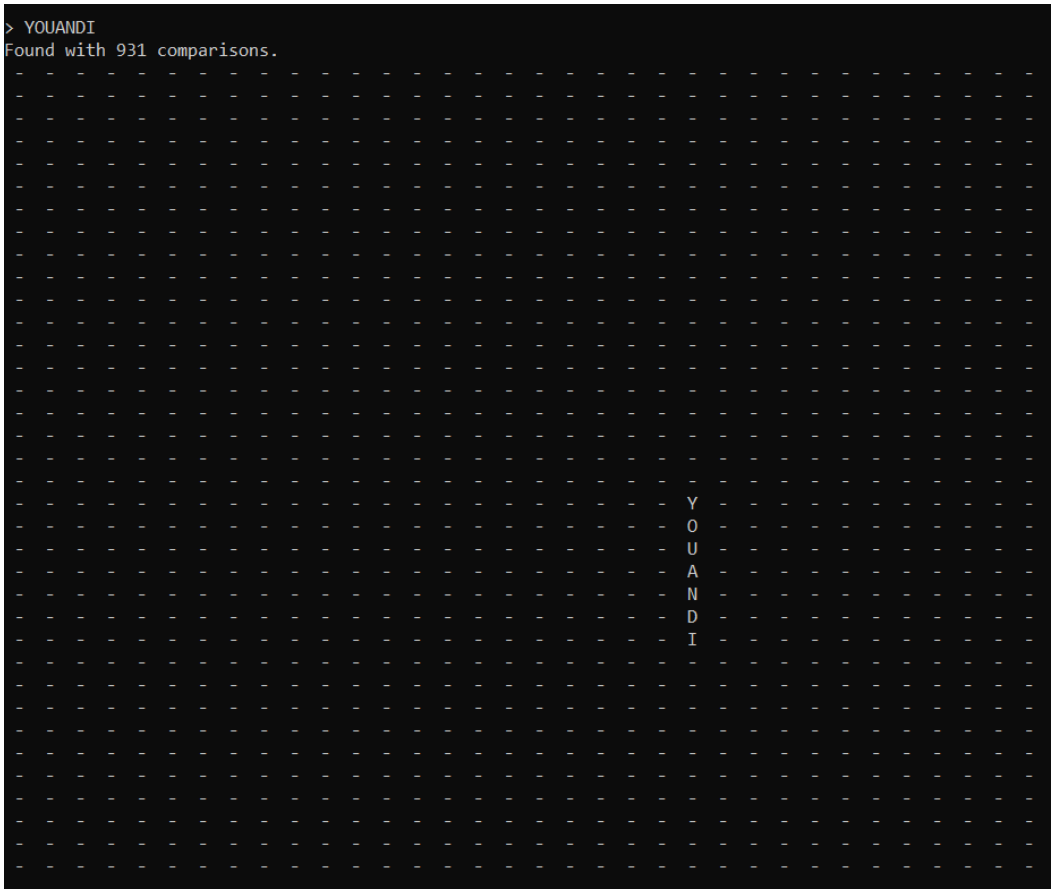

> BOYFRIEND
Found with 621 comparisons.
D
N
E
I
R
F
Y
O
B

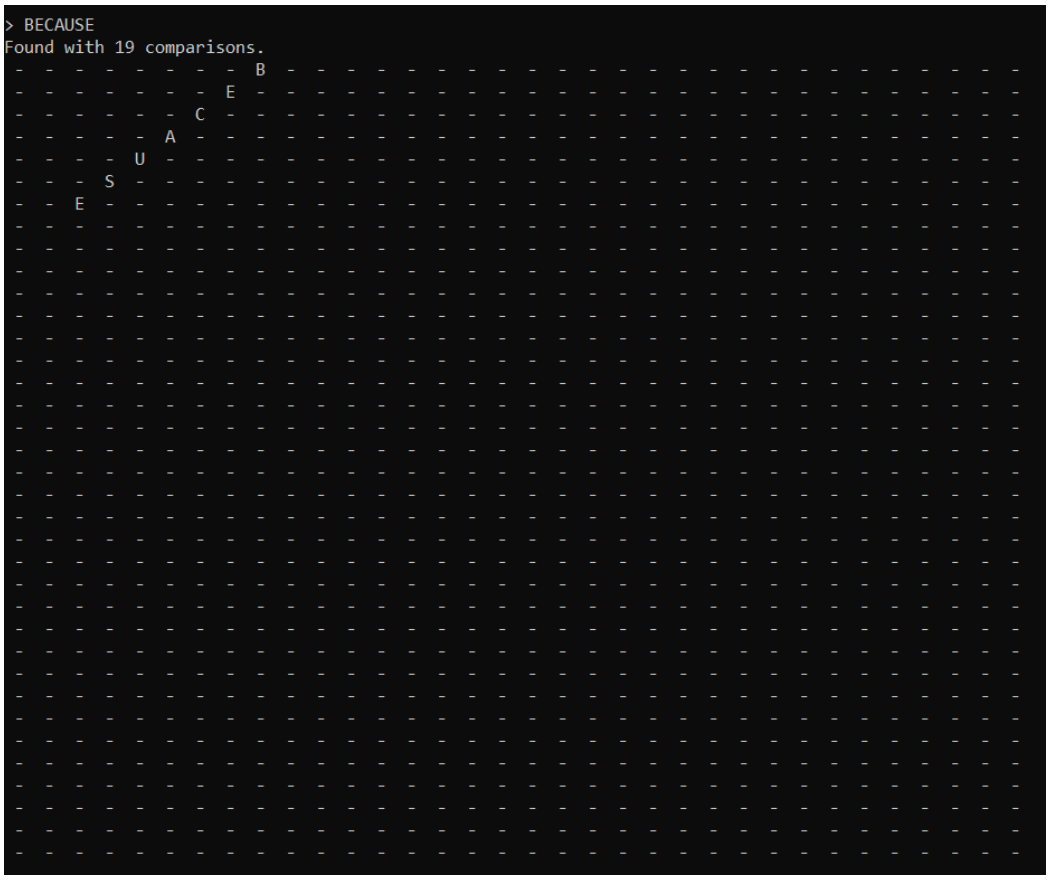

> DUMBDUMB
Found with 639 comparisons.
B
M
U
D
B
M
U
D


> DEVIL
Found with 817 comparisons.
L
I
V
E
D

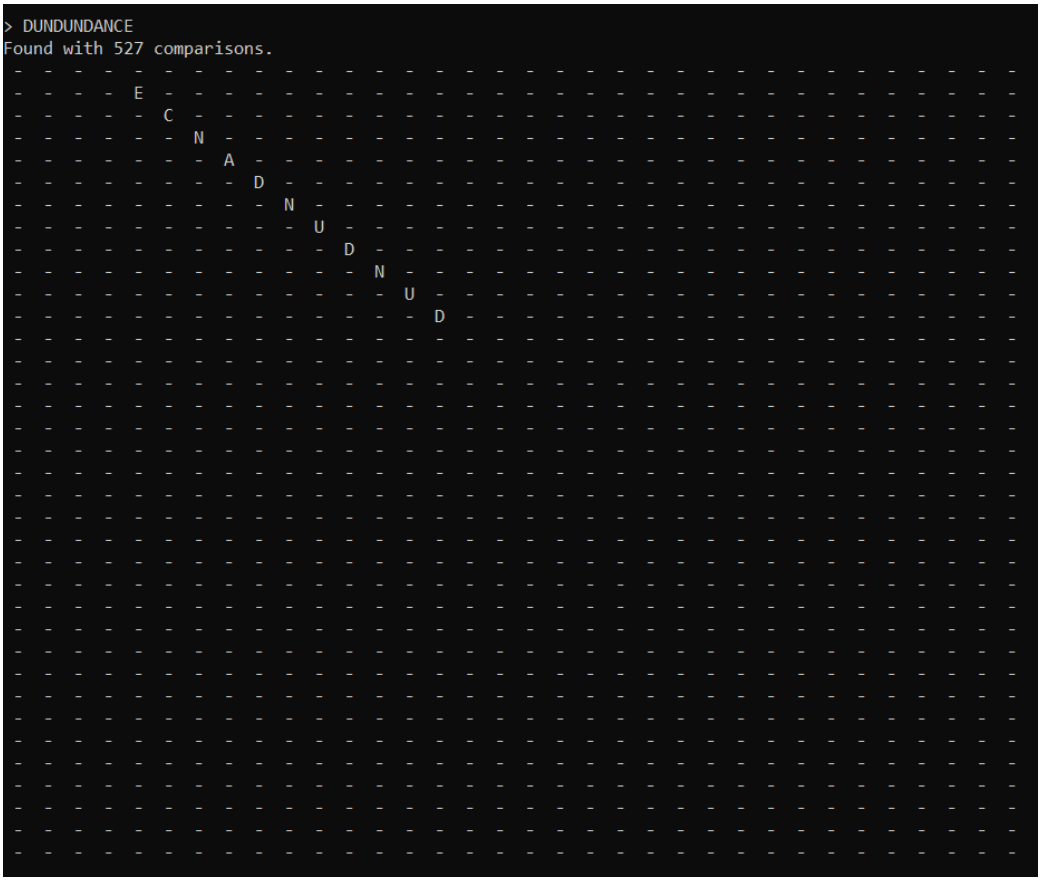

> BIMBAMBUM
Found with 1367 comparisons.
B I M B A M B U M

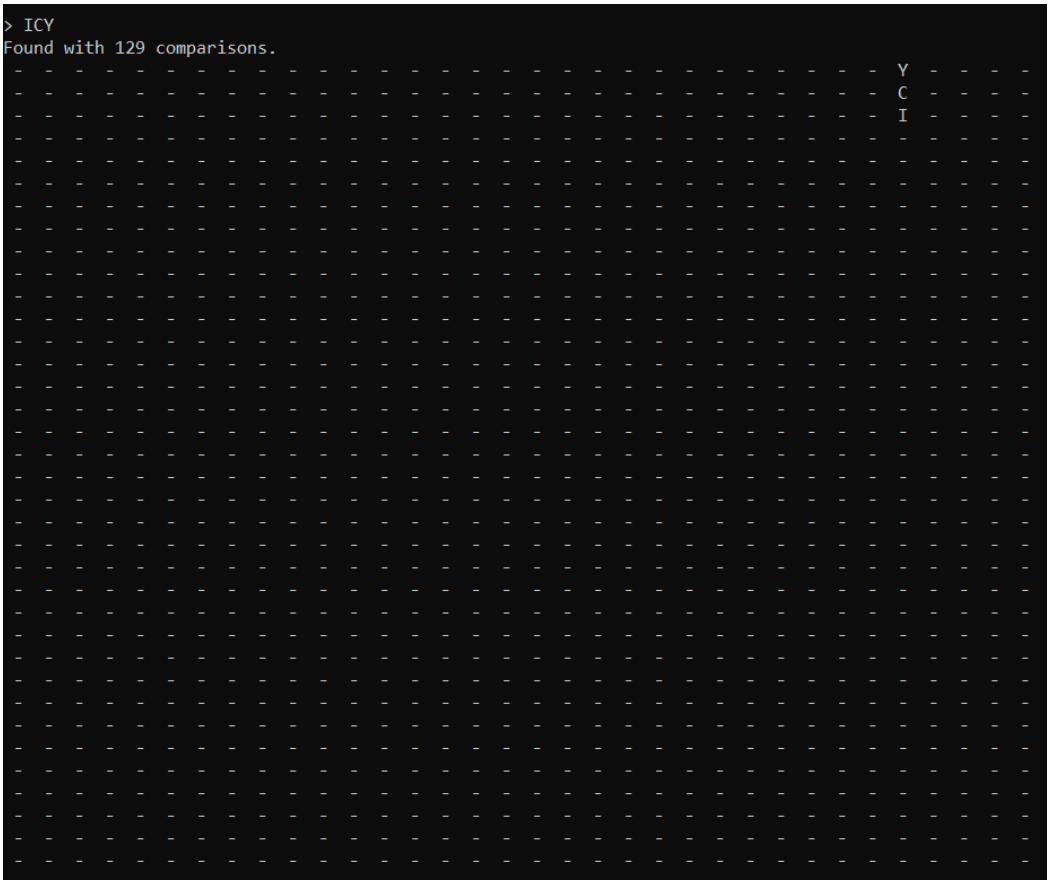

> DEJAVU
Found with 43 comparisons.
D
E
J
A
V
U

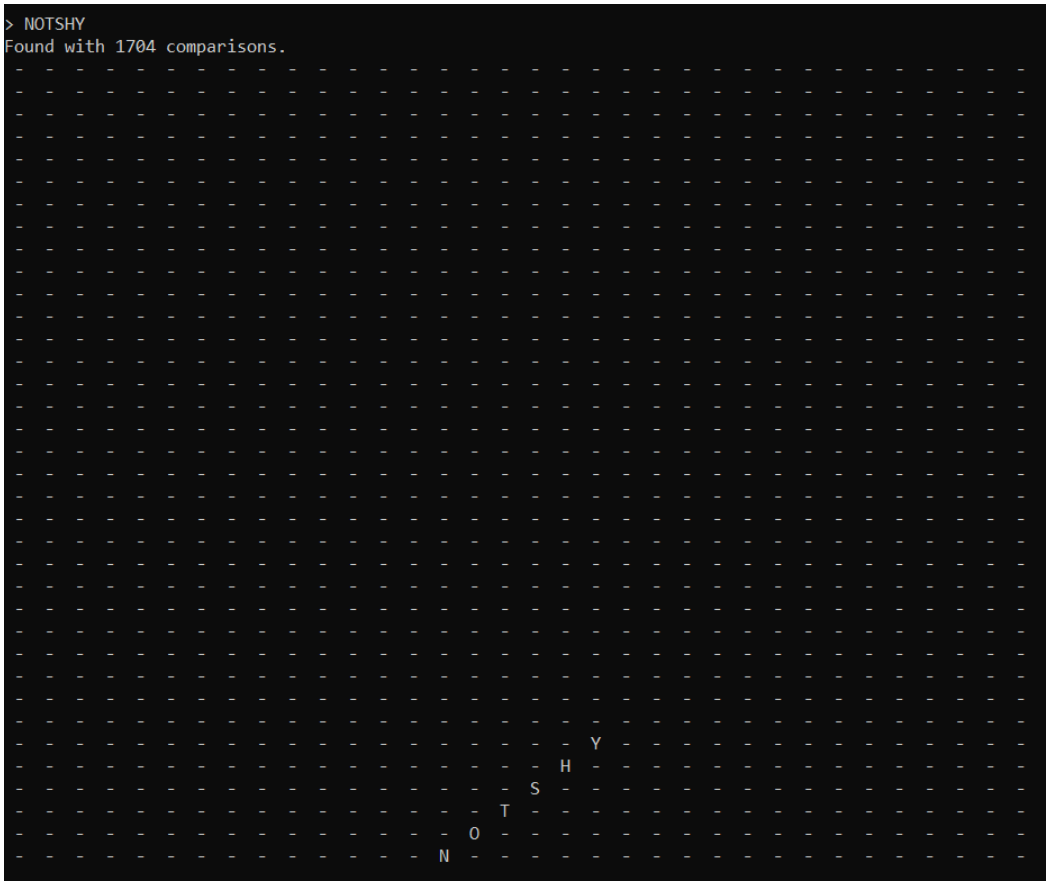

> YOUANDI
Found with 931 comparisons.
Y
O
U
A
N
D
I


> BECAUSE
Found with 19 comparisons.
B
E
C
A
U
S
E


> BBYONG
Found with 494 comparisons.
G N O Y B B


> DUNDUNDANCE
Found with 527 comparisons.


> ICY
Found with 129 comparisons.
Y
C
I


> NOTSHY
Found with 1704 comparisons.
Y
H
S
T
O
N


> OOPSY
Found with 846 comparisons.
O O P S Y
Total words : 50 (found: 50, not found: 0)
Total comparisons : 34409
Total time taken : 998500 nanoseconds

BAB IV
PENUTUP

A. Capaian

No.	Poin	Tercapai
1.	Program berhasil dikompilasi tanpa kesalahan (no syntax error)	Ya
2.	Program berhasil running	Ya
3.	Program dapat membaca file masukan dan menuliskan luaran	Ya
4.	Program berhasil menemukan semua kata di dalam puzzle	Ya

B. Kesimpulan

Penulis berhasil membuat program untuk menyelesaikan persoalan *word search puzzle* dengan algoritma *brute force* dengan bahasa C++ sesuai dengan spesifikasi yang diberikan. Penyelesaian dilakukan dengan pendekatan non-heuristik. Waktu yang dibutuhkan untuk menjalankan program pada *test case* yang dicantumkan sangat cepat sehingga sulit diukur, namun tercatat tidak melebihi 1 milisekon untuk 50 kata pada *puzzle* 36x34 dengan kurang lebih 35 ribu perbandingan huruf.

C. Saran

Program penyelesaian *word search puzzle* dengan algoritma *brute force* dapat memanfaatkan pendekatan heuristik untuk mengurangi jumlah komputasi yang dilakukan sehingga mempercepat proses pencarian.

LAMPIRAN

A. Source Program

Source lengkap program dapat diakses pada platform GitHub melalui link berikut https://github.com/hilyafadhilah/tucil1-stima