BLM3021 Algorithm Analysis
Assignment - III

Group 2

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Structures:

```
/*
        the dictionary hashtable and the wrongWord hashtable structures are
        very similar to each other, so instead making another structure for
        wrong word table i will make an instance of the dictionary table,
        when the table is dictionary instance the suggestion part will be empty
 */
typedef struct{
        char *kelime;
        char *suggestion;
}word;

typedef struct{
        word * words;
        int tableSize;
}hashTable;
```

Functions and macros:

Macro 1:

```
        #define min(a,b) \
          ({ __typeof__ (a) _a = (a); \
             __typeof__ (b) _b = (b); \
           _a < _b ? _a : _b; })
```

A macro to find the minimum of two values.

Functions:

```
/* PROTOTYPES and declerations: the explanation is under the main function:*/
    1.  unsigned long long int horner(const char* str);
    2.  int h1(unsigned long long int key);
    3.  int h2(unsigned long long int key);
    4.  int hash(unsigned long long int key,int i);
    5.  hashTable* init_table(hashTable * );
    6.  word * createWord();
    7.  char * upper(char *str);
    8.  void print(hashTable *);
    9.  void insertToTable(hashTable * ,char* ,char* );
    10. int searchTable(hashTable * ,char* wrd);
    11. int searchForUserWord(hashTable * ,char* wrd);
    12. int length(char*);
    13. void searchEveryWord(hashTable *,hashTable * ,char*);
    14. void checkdifference(hashTable* ,hashTable* wrongWord, char* wrd,char*
        sentence);
    15. int updateTable(hashTable * ,char * filename);
    16. int levinshtein(char* str1,char* str2);
```

Functions from 1 to 4:

Functions for doubleHashing implementation.

1. ***hashTable* init_table(hashTable *):***

   Initializing my hash table either dictionary or wrongWord

2. ***word * createWord():***

   Allocating memory for word struct: INITIALIZATION.

3. ***char * upper(char *str);***

   converting to capital letters.

4. ***void insertToTable(hashTable * ,char* ,char*);***

   Inserting new words to the dictionary or the wrongWord Table, and add its suggestion (the word chosen by the user) with it;

5. ***int searchTable(hashTable * ,char* wrd);***

   if the word is found , then return its index,other wise -1

6. ***int searchForUserWord(hashTable * ,char* wrd);***

   searching for the words entered by the user

   if it is found then return its index

   otherwise return 0.

7. ***void searchEveryWord(hashTable *,hashTable * ,char*);***

   takes the sentence and split it into words, if the word

   is not in the dictionary table then we search in the worngWord table

   if it is found then we replace the wrong word with the suggestion

   (right word entered before by the user)

   if it is not found then we calculate its distance with the words

   in the dictionary,

   then displays the words with distance of 1 ,if there is not words with distance of 1

   then displays the words with distance of 2;

   if there are no words with dist 1 or 2 then inform the user that there isn't any word

   similar to his word in our dictionary.

8. *void checkdifference(hashTable* ,hashTable* wrongWord, char* wrd,char* sentence);*

   adding the words with distance 1 to an array,
   and adding the words with distance 2 to a different array
   if there is one word in the first array then display it as a suggestion
   otherwise display the second array.

9. *int length(char*);*

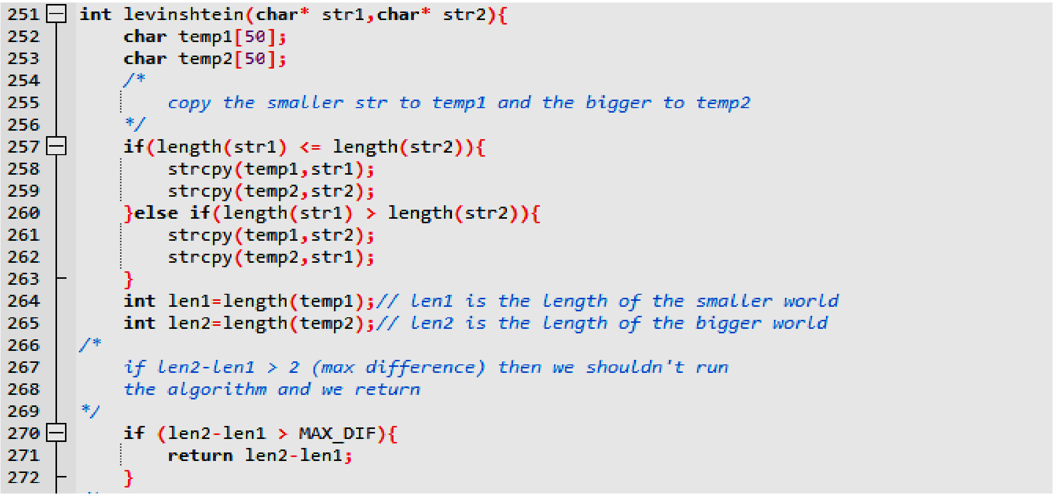
   i forgot about strlen() :) so i coded it myself.

10. *int updateTable(hashTable * ,char * filename);*

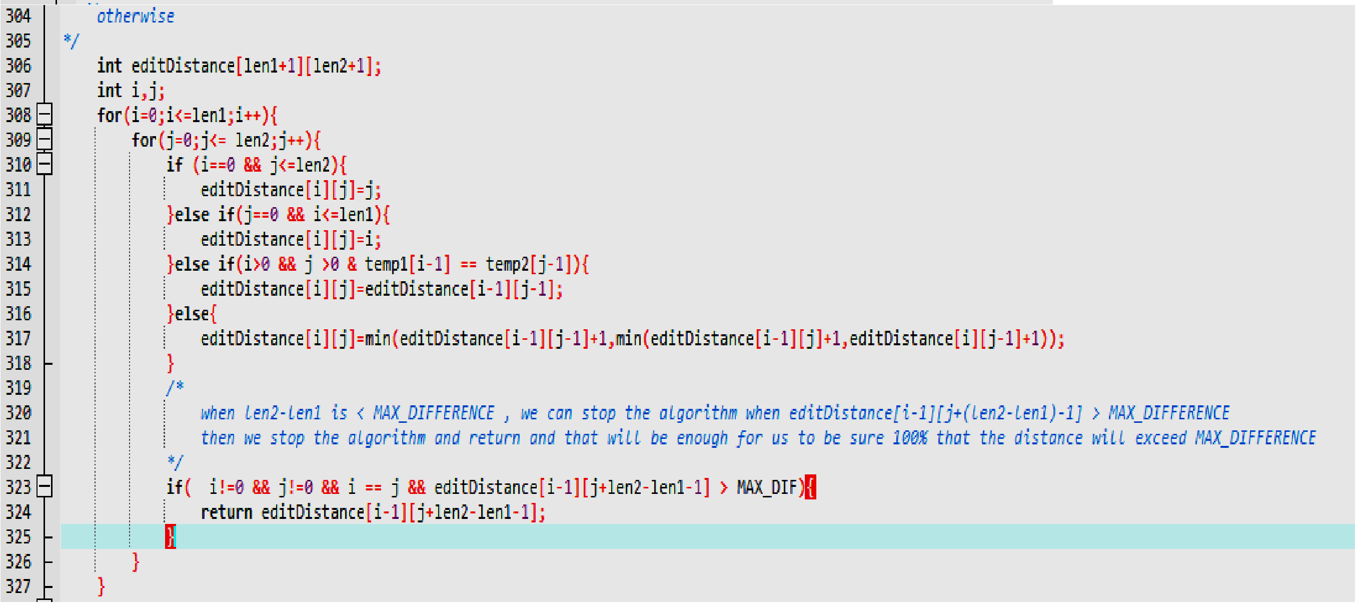
    reading the smalldictionary file and insert it in my dictionary hash table.

11. *int levinshtein(char* str1,char* str2);*

    calculating the distance between two words.



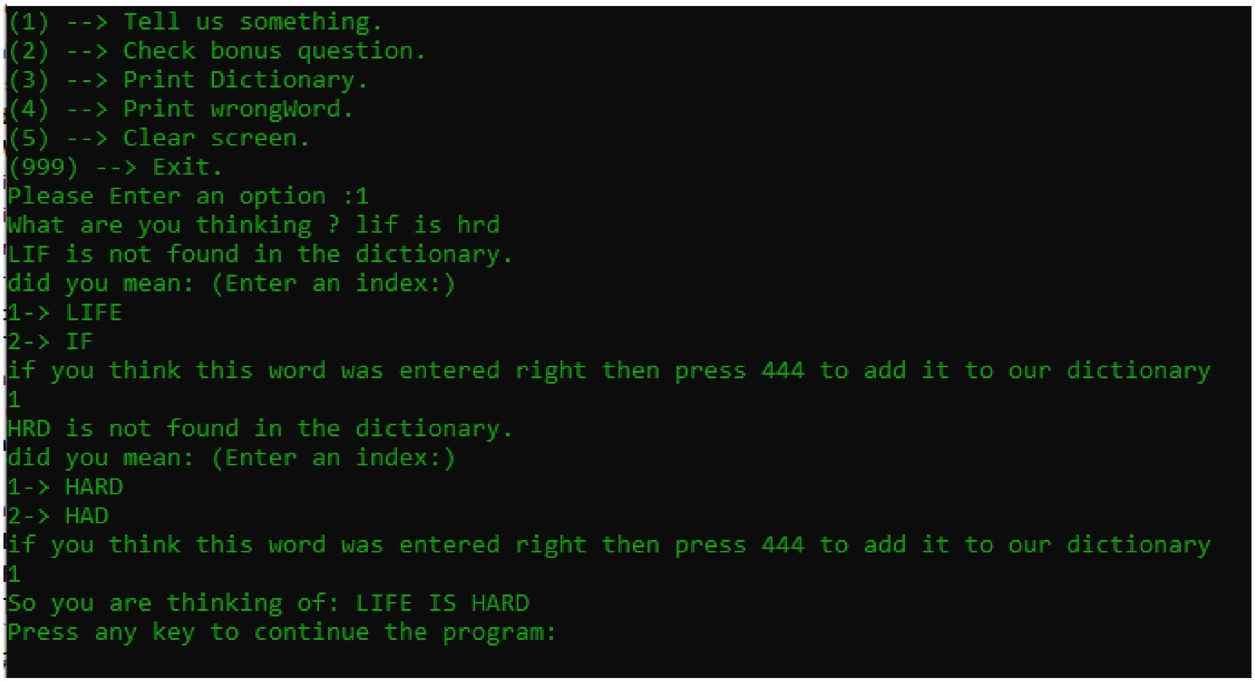
```
int levinshtein(char* str1,char* str2){
    char temp1[50];
    char temp2[50];
    /*
        copy the smaller str to temp1 and the bigger to temp2
    */
    if(length(str1) <= length(str2)){
        strcpy(temp1,str1);
        strcpy(temp2,str2);
    }else if(length(str1) > length(str2)){
        strcpy(temp1,str2);
        strcpy(temp2,str1);
    }
    int len1=length(temp1);// len1 is the length of the smaller world
    int len2=length(temp2);// len2 is the length of the bigger world
/*
    if len2-len1 > 2 (max difference) then we shouldn't run
    the algorithm and we return
*/
    if (len2-len1 > MAX_DIF){
        return len2-len1;
    }
```



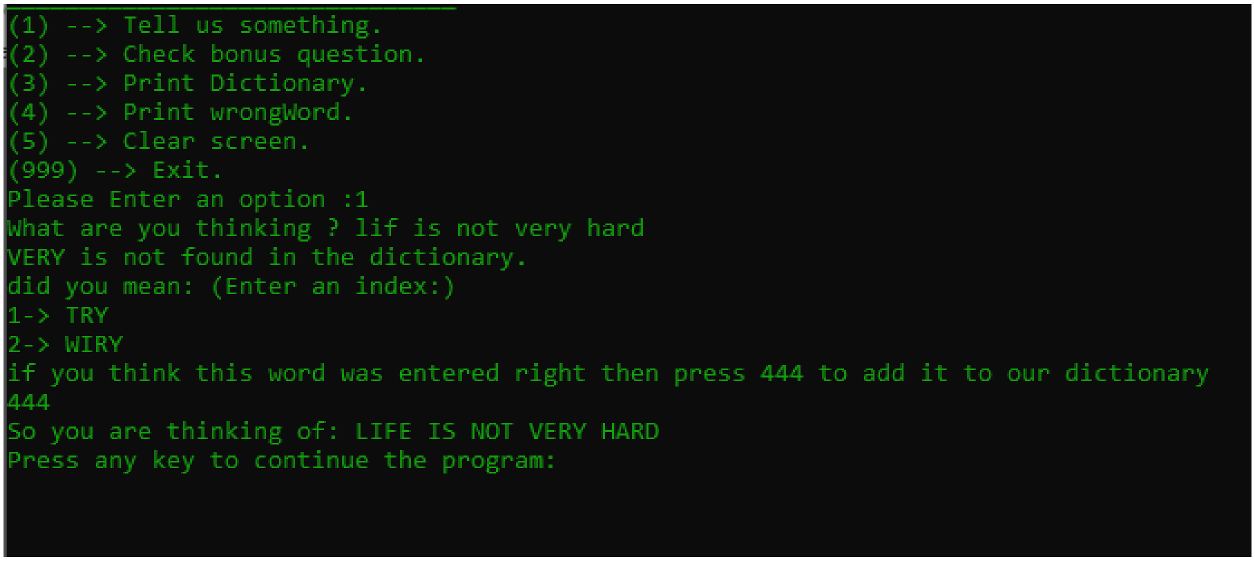
```
    otherwise
*/
    int editDistance[len1+1][len2+1];
    int i,j;
    for(i=0;i<=len1;i++){
        for(j=0;j<= len2;j++){
            if (i==0 && j<=len2){
                editDistance[i][j]=j;
            }else if(j==0 && i<=len1){
                editDistance[i][j]=i;
            }else if(i>0 && j >0 & temp1[i-1] == temp2[j-1]){
                editDistance[i][j]=editDistance[i-1][j-1];
            }else{
                editDistance[i][j]=min(editDistance[i-1][j-1]+1,min(editDistance[i-1][j]+1,editDistance[i][j-1]+1));
            }
            /*
                when len2-len1 is < MAX_DIFFERENCE , we can stop the algorithm when editDistance[i-1][j+(len2-len1)-1] > MAX_DIFFERENCE
                then we stop the algorithm and return and that will be enough for us to be sure 100% that the distance will exceed MAX_DIFFERENCE
            */
            if(  i!=0 && j!=0 && i == j && editDistance[i-1][j+len2-len1-1] > MAX_DIF){
                return editDistance[i-1][j+len2-len1-1];
            }
        }
    }
```

Screen Shots:

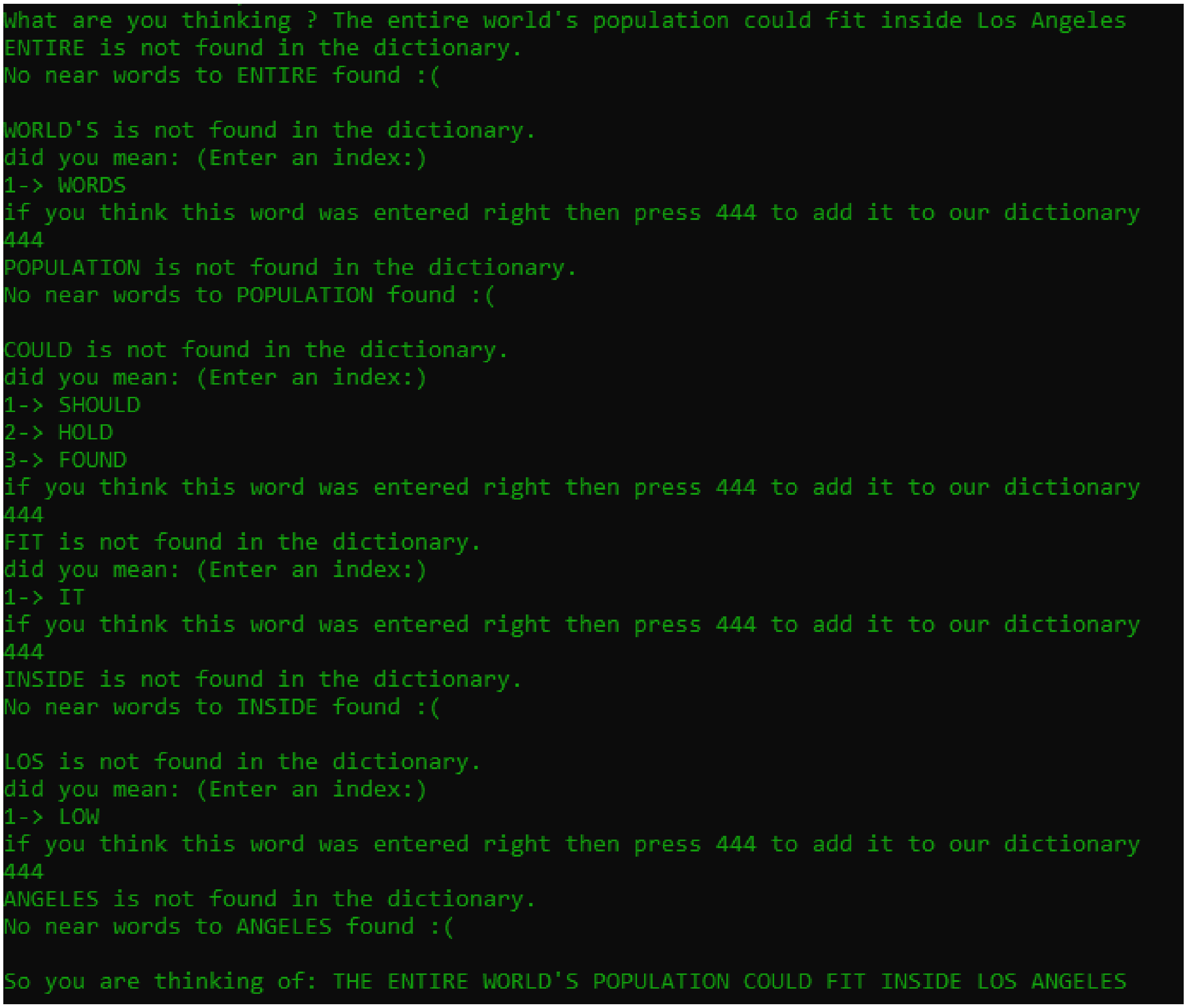
These screen shots were token in one run, without exiting the program.



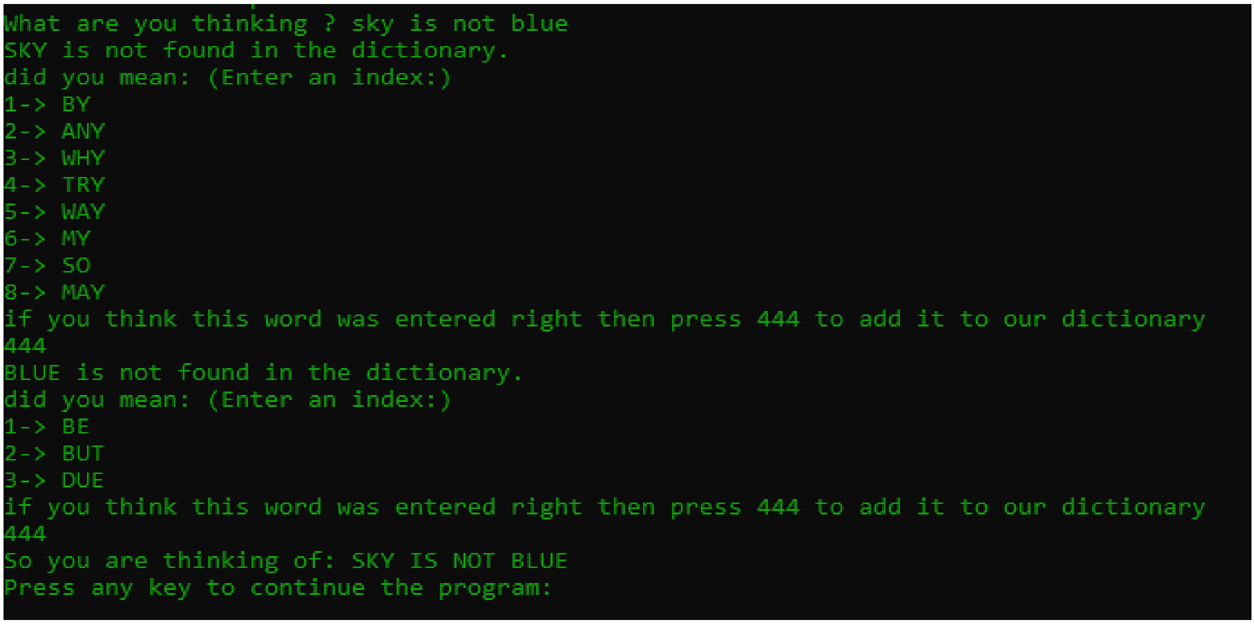
```
(1) --> Tell us something.
(2) --> Check bonus question.
(3) --> Print Dictionary.
(4) --> Print wrongWord.
(5) --> Clear screen.
(999) --> Exit.
Please Enter an option :1
What are you thinking ? lif is hrd
LIF is not found in the dictionary.
did you mean: (Enter an index:)
1-> LIFE
2-> IF
if you think this word was entered right then press 444 to add it to our dictionary
1
HRD is not found in the dictionary.
did you mean: (Enter an index:)
1-> HARD
2-> HAD
if you think this word was entered right then press 444 to add it to our dictionary
1
So you are thinking of: LIFE IS HARD
Press any key to continue the program:
```



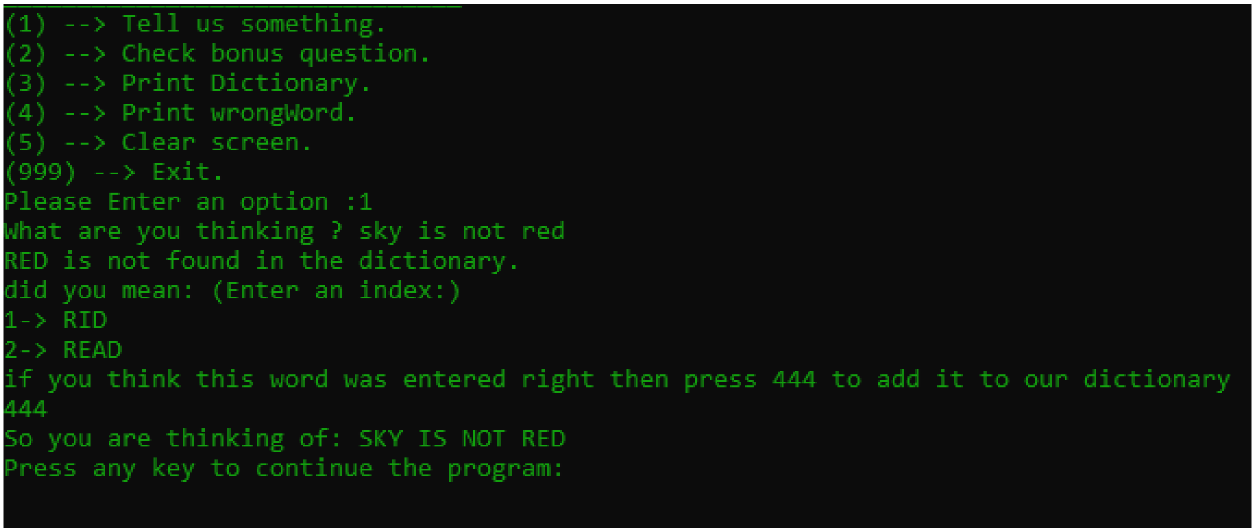
```
(1) --> Tell us something.
(2) --> Check bonus question.
(3) --> Print Dictionary.
(4) --> Print wrongWord.
(5) --> Clear screen.
(999) --> Exit.
Please Enter an option :1
What are you thinking ? lif is not very hard
VERY is not found in the dictionary.
did you mean: (Enter an index:)
1-> TRY
2-> WIRY
if you think this word was entered right then press 444 to add it to our dictionary
444
So you are thinking of: LIFE IS NOT VERY HARD
Press any key to continue the program:
```



```
What are you thinking ? The entire world's population could fit inside Los Angeles
ENTIRE is not found in the dictionary.
No near words to ENTIRE found :(

WORLD'S is not found in the dictionary.
did you mean: (Enter an index:)
1-> WORDS
if you think this word was entered right then press 444 to add it to our dictionary
444
POPULATION is not found in the dictionary.
No near words to POPULATION found :(

COULD is not found in the dictionary.
did you mean: (Enter an index:)
1-> SHOULD
2-> HOLD
3-> FOUND
if you think this word was entered right then press 444 to add it to our dictionary
444
FIT is not found in the dictionary.
did you mean: (Enter an index:)
1-> IT
if you think this word was entered right then press 444 to add it to our dictionary
444
INSIDE is not found in the dictionary.
No near words to INSIDE found :(

LOS is not found in the dictionary.
did you mean: (Enter an index:)
1-> LOW
if you think this word was entered right then press 444 to add it to our dictionary
444
ANGELES is not found in the dictionary.
No near words to ANGELES found :(

So you are thinking of: THE ENTIRE WORLD'S POPULATION COULD FIT INSIDE LOS ANGELES
```

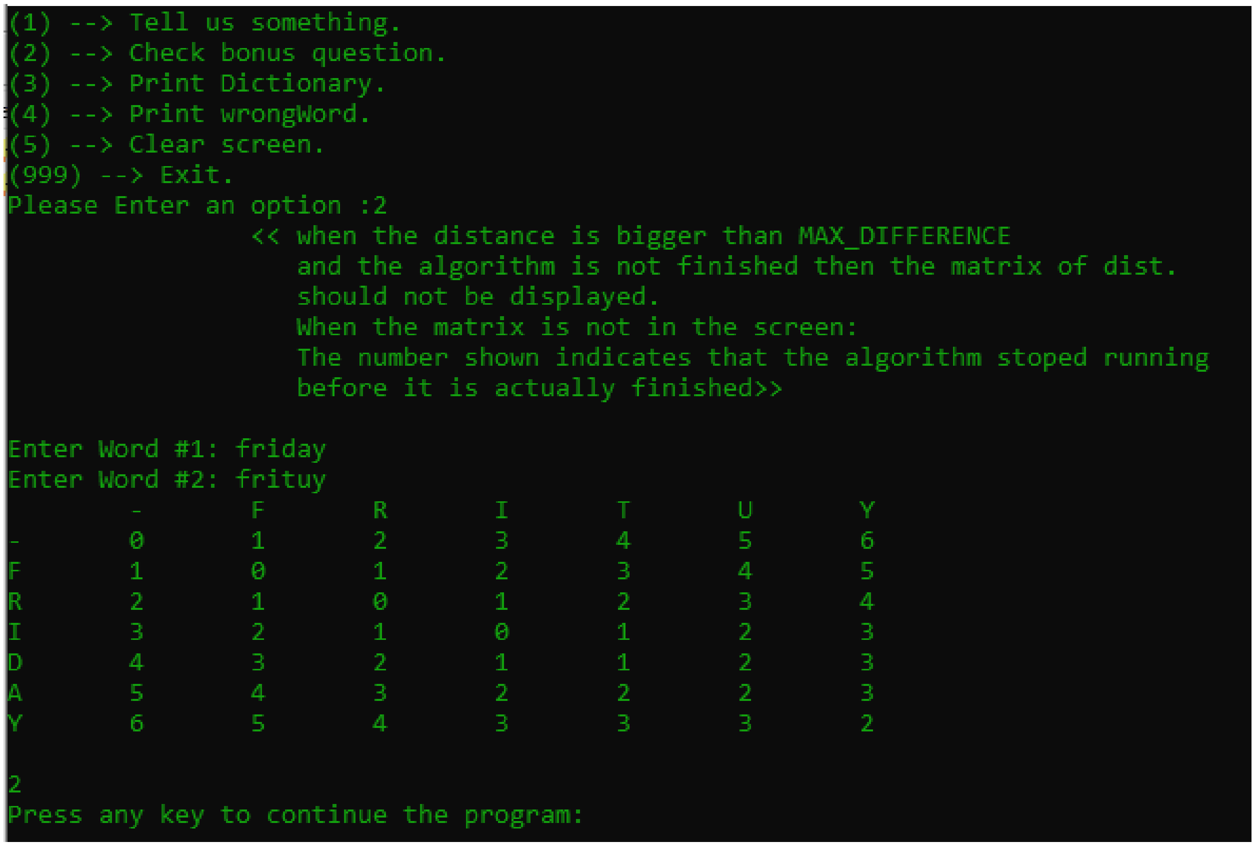


```
What are you thinking ? sky is not blue
SKY is not found in the dictionary.
did you mean: (Enter an index:)
1-> BY
2-> ANY
3-> WHY
4-> TRY
5-> WAY
6-> MY
7-> SO
8-> MAY
if you think this word was entered right then press 444 to add it to our dictionary
444
BLUE is not found in the dictionary.
did you mean: (Enter an index:)
1-> BE
2-> BUT
3-> DUE
if you think this word was entered right then press 444 to add it to our dictionary
444
So you are thinking of: SKY IS NOT BLUE
Press any key to continue the program:
```

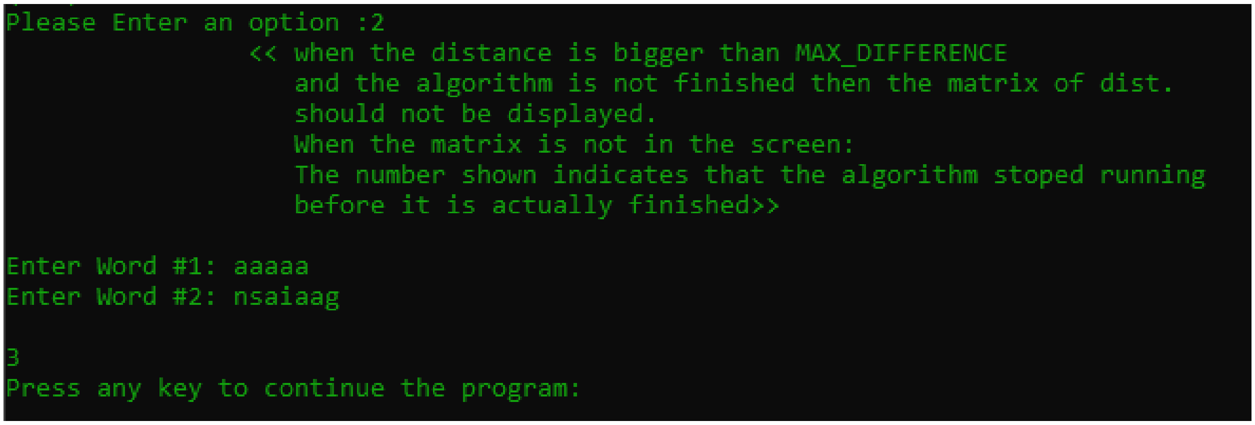


```
(1) --> Tell us something.
(2) --> Check bonus question.
(3) --> Print Dictionary.
(4) --> Print wrongWord.
(5) --> Clear screen.
(999) --> Exit.
Please Enter an option :1
What are you thinking ? sky is not red
RED is not found in the dictionary.
did you mean: (Enter an index:)
1-> RID
2-> READ
if you think this word was entered right then press 444 to add it to our dictionary
444
So you are thinking of: SKY IS NOT RED
Press any key to continue the program:
```

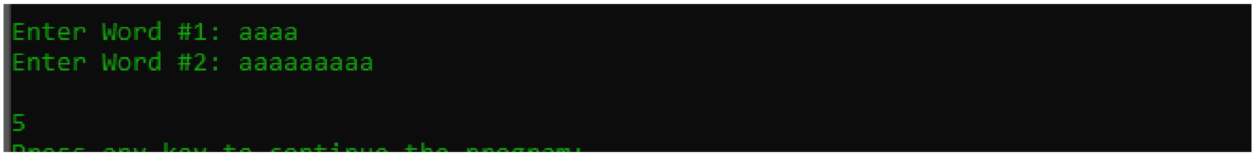
Option 2:



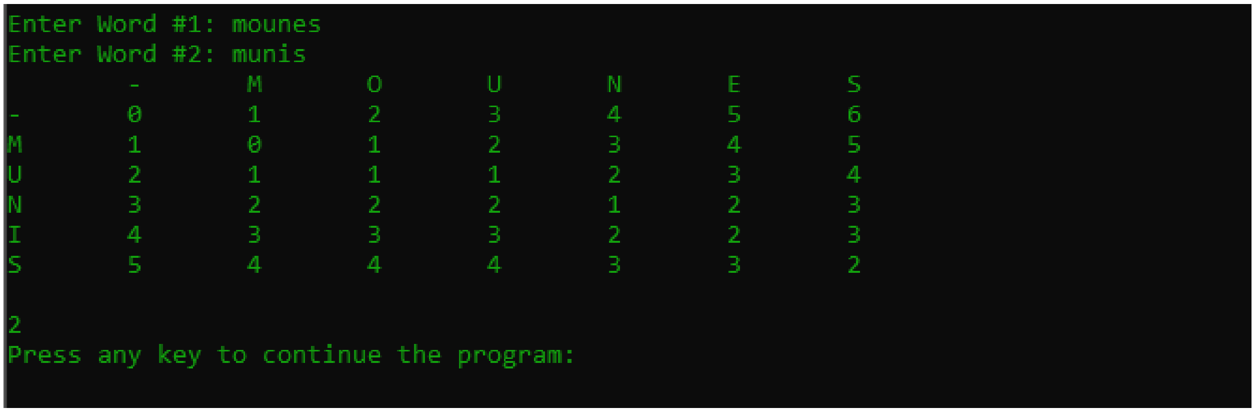
```
(1) --> Tell us something.
(2) --> Check bonus question.
(3) --> Print Dictionary.
(4) --> Print wrongWord.
(5) --> Clear screen.
(999) --> Exit.
Please Enter an option :2
                << when the distance is bigger than MAX_DIFFERENCE
                   and the algorithm is not finished then the matrix of dist.
                   should not be displayed.
                   When the matrix is not in the screen:
                   The number shown indicates that the algorithm stoped running
                   before it is actually finished>>

Enter Word #1: friday
Enter Word #2: frituy
        -       F       R       I       T       U       Y
-       0       1       2       3       4       5       6
F       1       0       1       2       3       4       5
R       2       1       0       1       2       3       4
I       3       2       1       0       1       2       3
D       4       3       2       1       1       2       3
A       5       4       3       2       2       2       3
Y       6       5       4       3       3       3       2

2
Press any key to continue the program:
```



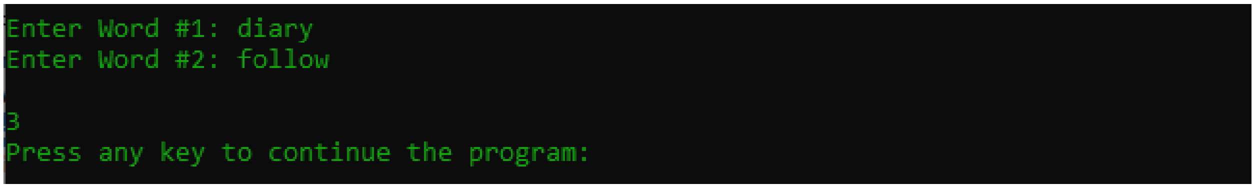
```
Please Enter an option :2
                << when the distance is bigger than MAX_DIFFERENCE
                   and the algorithm is not finished then the matrix of dist.
                   should not be displayed.
                   When the matrix is not in the screen:
                   The number shown indicates that the algorithm stoped running
                   before it is actually finished>>

Enter Word #1: aaaaa
Enter Word #2: nsaiaag

3
Press any key to continue the program:
```



```
Enter Word #1: aaaa
Enter Word #2: aaaaaaaaa

5
Press any key to continue the program:
```



```
Enter Word #1: mounes
Enter Word #2: munis
        -       M       O       U       N       E       S
-       0       1       2       3       4       5       6
M       1       0       1       2       3       4       5
U       2       1       1       1       2       3       4
N       3       2       2       2       1       2       3
I       4       3       3       3       2       2       3
S       5       4       4       4       3       3       2

2
Press any key to continue the program:
```



```
Enter Word #1: diary
Enter Word #2: follow

3
Press any key to continue the program:
```