

CENG 2010 Programming Language Concepts, Spring 2021

MIDTERM EXAM HOMEWORK

DUE DATE: 29.04.2021 - 23:59

30% OF THE OVERALL GRADE

Send your code via DYS

This is an individual work. No team work is allowed.

Similarity check will be applied to submitted codes.

In your midterm, you are going to write a puzzle solver. Please follow the steps given below in order to prevent any point reduction from your grade.

First of all, check the .txt files shared with you. In each file, the first row includes the number of rows, number of columns, and the number of words to be solved. Starting from the second row of the file, information about each word is given in the order of: its direction, starting row and column number, its name, and finally the hint about the word given to the user. Let's examine puzzle2010.txt:

5 5 7

H 1 1 MILK White liquid produced by the mammals

H 2 1 IN Used to indicate inclusion within space, a place, or limits

H 3 3 BUS A road vehicle designed to carry many passengers

H 5 3 DAN The name of a famous author whose surname is Brown

V 1 1 MIND A set of cognitive faculties, e.g. consciousness, perception, etc.

V 3 3 BAD Opposite of good

V 2 5 ISBN International Standard Book Number

In the above example (puzzle2010.txt), we have 5 rows, 5 columns and 7 words. For instance, MILK starts at position 1-1, goes horizontal, and its hint is: White liquid produced by the mammals.

Initially, our puzzle should look like the right image where words to be solved are empty and shown with underscores ('_') while blank areas are shown with #. Row and column numbers together with framing |, * and dashes are also given.

```
Game is 5 rows x 5 cols with 7 words
Words and clues are read!
Current puzzle:

      1  2  3  4  5
    -  -  -  -  -
1   |  _  _  _  _  #
2   |  _  _  #  #  _
3   |  _  #  _  _  _
4   |  _  #  _  #  _
5   |  #  #  _  _  _
    *****
```

Below, you can find step-by-step gameplay of puzzle2010.txt. Gameplay with a longer text file and also with an erroneous text file is also given at the end of this document.

```
Game is 5 rows x 5 cols with 7 words
Words and clues are read!
Current puzzle:

    1 2 3 4 5
  -- -- -- --
1  | - - - - #
2  | - - # # -
3  | - # - - -
4  | - # - # -
5  | # # - - -
*****

Ask for hint:
# Direction      row col
-----
1: Horizontal    1     1
2: Horizontal    2     1
3: Horizontal    3     3
4: Horizontal    5     3
5: Vertical      1     1
6: Vertical      3     3
7: Vertical      2     5

Enter -1 to exit
Which word to solve next?: 1
Current hint: White liquid produced by the mammals
Enter your solution: milk

Correct!

Current puzzle:

    1 2 3 4 5
  -- -- -- --
1  | M I L K #
2  | - - # # -
3  | - # - - -
4  | - # - # -
5  | # # - - -
*****

Ask for hint:
# Direction      row col
-----
2: Horizontal    2     1
3: Horizontal    3     3
4: Horizontal    5     3
5: Vertical      1     1
6: Vertical      3     3
7: Vertical      2     5

Enter -1 to exit
Which word to solve next?: 2
Current hint: Used to indicate inclusion within space, a place,
or limits
Enter your solution: in

Correct!

Current puzzle:

    1 2 3 4 5
  -- -- -- --
1  | M I L K #
2  | I N # # -
3  | - # - - -
4  | - # - # -
5  | # # - - -
*****

Ask for hint:
# Direction      row col
-----
3: Horizontal    3     3
4: Horizontal    5     3
5: Vertical      1     1
6: Vertical      3     3
7: Vertical      2     5

Enter -1 to exit
Which word to solve next?: 3
Current hint: A road vehicle designed to carry many passengers
Enter your solution: bus

Correct!

Current puzzle:

    1 2 3 4 5
  -- -- -- --
1  | M I L K #
2  | I N # # -
3  | - # B U S
4  | - # - # -
5  | # # - - -
*****

Ask for hint:
# Direction      row col
-----
4: Horizontal    5     3
5: Vertical      1     1
6: Vertical      3     3
7: Vertical      2     5

Enter -1 to exit
Which word to solve next?: 4
```

Current hint: The name of a famous author whose surname is Brown

Enter your solution: dan

Correct!

Current puzzle:

```
      1 2 3 4 5
      - - - - -
1     | M I L K #
2     | I N # # _
3     | _ # B U S
4     | _ # _ # _
5     | # # D A N
*****
```

Ask for hint:

```
# Direction      row  col
-----
5: Vertical      1     1
6: Vertical      3     3
7: Vertical      2     5
```

Enter -1 to exit

Which word to solve next?: 5

Current hint: A set of cognitive faculties, e.g. consciousness, perception, etc.

Enter your solution: mind

Correct!

Current puzzle:

```
      1 2 3 4 5
      - - - - -
1     | M I L K #
2     | I N # # _
3     | N # B U S
4     | D # _ # _
5     | # # D A N
*****
```

Ask for hint:

```
# Direction      row  col
-----
6: Vertical      3     3
7: Vertical      2     5
```

Enter -1 to exit

Which word to solve next?: 6

Current hint: Opposite of good

Enter your solution: bad

Correct!

Current puzzle:

```
      1 2 3 4 5
      - - - - -
1     | M I L K #
2     | I N # # _
3     | N # B U S
4     | D # A # _
5     | # # D A N
*****
```

Ask for hint:

```
# Direction      row  col
-----
7: Vertical      2     5
```

Enter -1 to exit

Which word to solve next?: 7

Current hint: International Standard Book Number

Enter your solution: isbn

Correct!

Current puzzle:

```
      1 2 3 4 5
      - - - - -
1     | M I L K #
2     | I N # # I
3     | N # B U S
4     | D # A # B
5     | # # D A N
```

Congratulations! You beat the puzzle!

First of all, include below struct and function declarations in your code.

```
typedef struct
{
    char *word; //word and corresponding hint
    char *clue;
    int x; //Starting x and y positions
    int y;
    char direction; //H for horizontal, V for vertical
    int f; //solved or not
} Word_t;

Word_t* loadTextFile( FILE* myFile, int nrWords );
void displayBoard(int rows, int cols, char** myBoard);
int isBoardFilled(int rows, int cols, char** myBoard);
char** createArray(int rows, int cols);
int findIndex(int arr[], int size, int val);
void playGame(char** myBoard, int words, Word_t *words, int x, int y, int countToFinish);
char** updateBoard(char** myBoard, Word_t *words, int solve);
```

Function explanations (you can add more variables to each function and add more functions to your code if you need):

- main:
 - declarations you may need:
 - ✚ a dynamic array of board (e.g. `char** board`)
 - ✚ a file pointer to the file
 - ✚ number of rows, columns and words
 - ✚ a dynamic array of `Word_t` type
 - functionality
 - ✚ get the name of the file from the user and open the file
 - ✚ read number of rows, columns and words
 - ✚ dynamically allocate your `Word_t` type array in the size of words
 - ✚ call `loadTextFile` function and assign the returned array to your `Word_t` type array
 - ✚ call `createArray` and assign the result to your board
 - ✚ call `playGame`
 - ✚ free any dynamically allocated array
- `loadTextFile`:
 - Create a temporary `Word_t` type array and dynamically allocate it using the number of words
 - For each element of this array, read the direction, row-column starting numbers, word to be solved and its hint from the file.
- `createArray`:
 - Dynamically allocate a temporary board array (remember the dynamic memory allocation of 2D arrays from the lecture. First allocate memory for number of rows, then for each row, allocate memory for columns)
 - Initialize all elements of the array to '#'
- `displayBoard`:
 - Traverse the column array and display the column number
 - Traverse the column array and print dashes as separators
 - Print row numbers followed by '|' and print corresponding board element

- **isBoardFilled:**
 - If there is any blank in the table (e.g. '_'), return 0, else return 1
- **findIndex:**
 - Return 1 if the given value is found.
- **updateBoard:**
 - This function inserts the element with the index:solve into the board.
 - If the word is solved, insert the word. Else, put underscores ('_') in the length of this word.
- **playGame:**
 - Initially, update and display the board.
 - Now, create a loop in which the game is played. Game finishes whenever gameOver reaches to the number of total words or whenever there is no more blanks in the board.
 - For each word, display the associated direction, row, column info if it is not solved before
 - Ask the user to enter a word number
 - Check the validity of the input (solved before, or valid in range, etc.)
 - Show hint
 - Get the answer
 - If correct, increment gameOver counter, update the board and display the board.
 - Check whether the board is filled or not.

Step-by-step gameplay of puzzle2010long.txt

Game is 6 rows x 6 cols with 14 words

Words and clues are read!

Current puzzle:

```
      1 2 3 4 5 6
    -- -- -- -- --
1  |  - - # - - -
2  |  - # - - - #
3  |  - # - - # #
4  |  - - - - # #
5  |  - - # # - -
6  |  # # # # - -
*****
```

Ask for hint:

#	Direction	row	col
1:	Horizontal	1	1
2:	Horizontal	1	4
3:	Horizontal	2	3
4:	Horizontal	3	3
5:	Horizontal	4	1
6:	Horizontal	5	1
7:	Horizontal	5	5
8:	Horizontal	6	5
9:	Vertical	1	1
10:	Vertical	4	2
11:	Vertical	2	3
12:	Vertical	1	4
13:	Vertical	1	5
14:	Vertical	5	5

Enter -1 to exit

Which word to solve next?: 3

Current hint: Opposite of push operation in stacks

Enter your solution: pop

Correct!

Current puzzle:

```
      1 2 3 4 5 6
    -- -- -- -- --
1  |  - - # - - -
2  |  - # P O P #
3  |  - # - - # #
4  |  - - - - # #
5  |  - - # # - -
6  |  # # # # - -
*****
```

Ask for hint:

#	Direction	row	col
1:	Horizontal	1	1
2:	Horizontal	1	4
4:	Horizontal	3	3
5:	Horizontal	4	1
6:	Horizontal	5	1
7:	Horizontal	5	5
8:	Horizontal	6	5
9:	Vertical	1	1
10:	Vertical	4	2
11:	Vertical	2	3
12:	Vertical	1	4
13:	Vertical	1	5
14:	Vertical	5	5

Enter -1 to exit

Which word to solve next?: 7

Current hint: Internet country code of Turkey

Enter your solution: TR

Correct!

Current puzzle:

```
      1 2 3 4 5 6
    -- -- -- -- --
1  |  - - # - - -
2  |  - # P O P #
3  |  - # - - # #
4  |  - - - - # #
5  |  - - # # T R
6  |  # # # # - -
*****
```

Ask for hint:

#	Direction	row	col
1:	Horizontal	1	1
2:	Horizontal	1	4
4:	Horizontal	3	3
5:	Horizontal	4	1
6:	Horizontal	5	1
8:	Horizontal	6	5
9:	Vertical	1	1
10:	Vertical	4	2
11:	Vertical	2	3
12:	Vertical	1	4
13:	Vertical	1	5
14:	Vertical	5	5

Enter -1 to exit

```

Ask for hint:
# Direction      row  col
-----
1: Horizontal    1    1
2: Horizontal    1    4
4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
9: Vertical      1    1
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

Enter -1 to exit
Which word to solve next?: 1
Current hint: Symbol of Sodium element
Enter your solution: NB
WRONG ANSWER
Current puzzle:

```

```

      1  2  3  4  5  6
    -----
1  |  _  _  #  _  _  _
2  |  _  #  P  O  P  #
3  |  _  #  _  _  #  #
4  |  _  _  _  _  #  #
5  |  _  _  #  #  T  R
6  |  #  #  #  #  _  _
    *****

```

```

Ask for hint:
# Direction      row  col
-----
1: Horizontal    1    1
2: Horizontal    1    4
4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
9: Vertical      1    1
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

```

Enter -1 to exit

```

Ask for hint:
# Direction      row  col
-----
1: Horizontal    1    1
2: Horizontal    1    4
4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
9: Vertical      1    1
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

Enter -1 to exit
Which word to solve next?: 9
Current hint: Opposite direction of south
Enter your solution: NORTH

```

Correct!

Current puzzle:

```

      1  2  3  4  5  6
    -----
1  |  N  _  #  _  _  _
2  |  O  #  P  O  P  #
3  |  R  #  _  _  #  #
4  |  T  _  _  _  #  #
5  |  H  _  #  #  T  R
6  |  #  #  #  #  _  _
    *****

```

```

Ask for hint:
# Direction      row  col
-----
1: Horizontal    1    1
2: Horizontal    1    4
4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

```

Enter -1 to exit

```

Ask for hint:
# Direction      row  col
-----
1: Horizontal    1    1
2: Horizontal    1    4
4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

Enter -1 to exit
Which word to solve next?: 1
Current hint: Symbol of Sodium element
Enter your solution: na

```

Correct!

Current puzzle:

```

      1  2  3  4  5  6
    -- -- -- -- --
1 | N  A  #  _  _  _
2 | O  #  P  O  P  #
3 | R  #  _  _  #  #
4 | T  _  _  _  #  #
5 | H  _  #  #  T  R
6 | #  #  #  #  _  _
    *****

```

```

Ask for hint:
# Direction      row  col
-----
2: Horizontal    1    4
4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

Enter -1 to exit

```

```

Which word to solve next?: 2
Current hint: A road vehicle designed to carry many
passengers
Enter your solution: bus

```

Correct!

Current puzzle:

```

      1  2  3  4  5  6
    -- -- -- -- --
1 | N  A  #  B  U  S
2 | O  #  P  O  P  #
3 | R  #  _  _  #  #
4 | T  _  _  _  #  #
5 | H  _  #  #  T  R
6 | #  #  #  #  _  _
    *****

```

```

Ask for hint:
# Direction      row  col
-----

```

```

4: Horizontal    3    3
5: Horizontal    4    1
6: Horizontal    5    1
8: Horizontal    6    5
10: Vertical     4    2
11: Vertical     2    3
12: Vertical     1    4
13: Vertical     1    5
14: Vertical     5    5

```

Enter -1 to exit

```

Which word to solve next?: 4
Current hint: Abbrev. Nuclear Sclerosis
Enter your solution: NS

```

Correct!

Current puzzle:

```

      1  2  3  4  5  6
    -- -- -- -- --
1 | N  A  #  B  U  S
2 | O  #  P  O  P  #
3 | R  #  N  S  #  #
4 | T  _  _  _  #  #
5 | H  _  #  #  T  R
6 | #  #  #  #  _  _
    *****

```


Ask for hint:

#	Direction	row	col
---	-----------	-----	-----

5:	Horizontal	4	1
6:	Horizontal	5	1
8:	Horizontal	6	5
10:	Vertical	4	2
11:	Vertical	2	3
12:	Vertical	1	4
13:	Vertical	1	5
14:	Vertical	5	5

Enter -1 to exit

Which word to solve next?: 5

Current hint: To throw up in the air

Enter your solution: toss

Correct!

Current puzzle:

	1	2	3	4	5	6	
1		N	A	#	B	U	S
2		O	#	P	O	P	#
3		R	#	N	S	#	#
4		T	O	S	S	#	#
5		H	_	#	#	T	R
6		#	#	#	#	_	_

Ask for hint:

#	Direction	row	col
---	-----------	-----	-----

6:	Horizontal	5	1
8:	Horizontal	6	5
10:	Vertical	4	2
11:	Vertical	2	3
12:	Vertical	1	4
13:	Vertical	1	5
14:	Vertical	5	5

Enter -1 to exit

Which word to solve next?: 6

Current hint: Abbrev. Human Resources

Enter your solution: HR

Correct!

Current puzzle:

	1	2	3	4	5	6	
1		N	A	#	B	U	S
2		O	#	P	O	P	#
3		R	#	N	S	#	#
4		T	O	S	S	#	#
5		H	R	#	#	T	R
6		#	#	#	#	_	_

Ask for hint:

#	Direction	row	col
---	-----------	-----	-----

8:	Horizontal	6	5
10:	Vertical	4	2
11:	Vertical	2	3
12:	Vertical	1	4
13:	Vertical	1	5
14:	Vertical	5	5

Enter -1 to exit

Which word to solve next?: 6

That word has been solved before

Enter -1 to exit

Which word to solve next?: 8

Current hint: Symbol of Silver element

Enter your solution: AG

Correct!

Current puzzle:

	1	2	3	4	5	6	
1		N	A	#	B	U	S
2		O	#	P	O	P	#
3		R	#	N	S	#	#
4		T	O	S	S	#	#
5		H	R	#	#	T	R
6		#	#	#	#	A	G

Congratulations! You beat the puzzle!

Problem with the puzzlewrong.txt

```

CMPE252 HW1 PUZZLE GAME

Enter name of text file: puzzlewrong.txt
Game is 5 rows x 5 cols with 7 words
Words and clues are read!
Current puzzle:

      1 2 3 4 5
    -- -- -- --
1   | _ _ _ _ #
2   | _ _ # _ _
3   | _ # _ _ _
4   | _ # _ # _
5   | # # _ _ _
    *****

Ask for hint:
# Direction      row  col
-----
1: Horizontal    1    1
2: Horizontal    2    1
3: Horizontal    3    3
4: Horizontal    5    3
5: Vertical      1    1
6: Vertical      3    3
7: Vertical      2    5

Enter -1 to exit
Which word to solve next?: 1
Current hint: White liquid produced by the mammals
Enter your solution: milk

Correct!

Current puzzle:

      1 2 3 4 5
    -- -- -- --
1   | M I L K #
2   | _ _ # _ _
3   | _ # _ _ _
4   | _ # _ # _
5   | # # _ _ _
    *****

```

```

# Direction      row  col
-----
2: Horizontal    2    1
3: Horizontal    3    3
4: Horizontal    5    3
5: Vertical      1    1
6: Vertical      3    3
7: Vertical      2    5

Enter -1 to exit
Which word to solve next?: 5
Current hint: Red planet
Enter your solution: mars

Correct!

Current puzzle:

      1 2 3 4 5
    -- -- -- --
1   | M I L K #
2   | A _ # _ _
3   | R # _ _ _
4   | S # _ # _
5   | # # _ _ _
    *****

Ask for hint:
# Direction      row  col
-----
2: Horizontal    2    1
3: Horizontal    3    3
4: Horizontal    5    3
6: Vertical      3    3
7: Vertical      2    5

Enter -1 to exit
Which word to solve next?: 2
Current hint: Used to indicate inclusion
within space, a place, or limits
Enter your solution: in

Correct!

Current puzzle:

      1 2 3 4 5
    -- -- -- --
1   | M I L K #
2   | I N # _ _
3   | R # _ _ _
4   | S # _ # _
5   | # # _ _ _
    *****

```

The program does not have to check the final condition of the word entered before (e.g. MARS → MIRS). Therefore, assume that .txt files are prepared correctly.