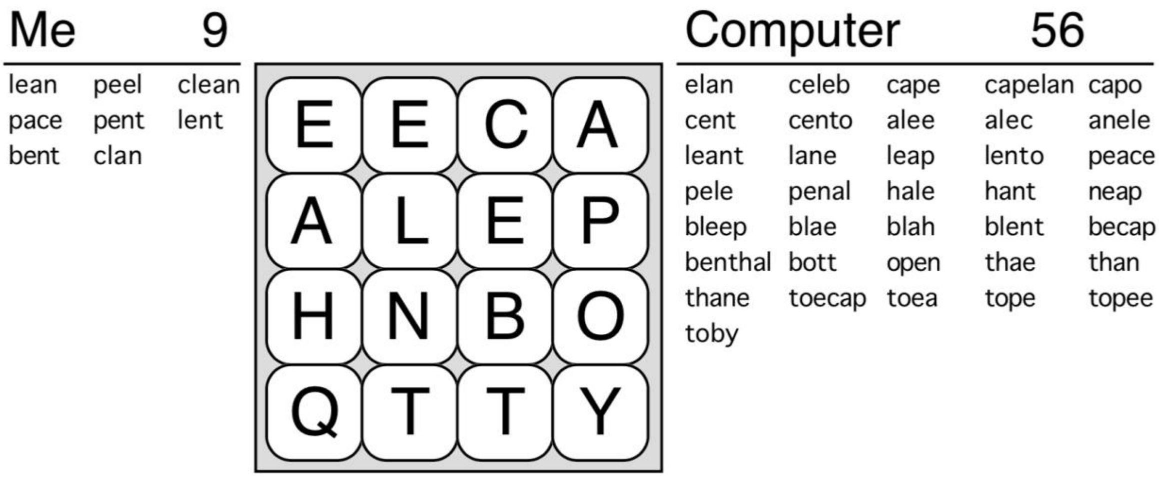
Lab 6: Boggle Game



Me 9

lean peel clean
pace pent lent
bent clan

E E C A
A L E P
H N B O
Q T T Y

Computer 56

elan celeb cape capelan capo
cent cento alee alec anele
leant lane leap lento peace
pele penal hale hant neap
bleep blae blah blent becap
benthal bott open thae than
thane toecap toea tope topee
toby

Boggle game

Your task this time is to implement a Boggle game that interacts through the command line. Boggle is a board game. N×N English capital letters are arranged on an N×N chessboard. Players connect adjacent letters to form English words and gain points. Each letter is adjacent to the eight letters surrounding it. During the connection process, each grid on the chessboard can only be passed at most once. When the player cannot find any more words, the computer will find all the remaining words. The picture above shows the GUI version of the game. What you need to implement this time is a command line version.

✓ **player turn**

On the player's turn, Boggle should first display the current state. Current status includes the following:

ÿ The first N rows represent the N×N chessboard
content; ÿ The following rows give the
user scores; ÿ The last row is the list of words that the user has found.

Then wait for a line of user input. User input includes two situations:

ÿ A line containing only three question marks "???" indicates that the user has been unable to find the word and has entered the computer round;
ÿ The rest of the cases are words that the user is trying to find.

A word that can earn points should meet the following conditions (please check in this order):

1) ÿ The word must be at least four letters long; ÿ

2) The word should be included in the English

dictionary; ÿ There is at least one path on the chessboard that can form the word (composed of adjacent letters, and each square has the most

3) Used more than once); 且每个格子最多使用一次

4) ÿ The word has not been found by the player before (even if there are multiple paths on the board to form the same word, the word will be counted at most once).

If any of the conditions is not met, the attempt fails and the corresponding error message is printed.

If a word can gain points, it needs to be added to the player's list of found words and the player's score will be increased. The length of the word determines the score: 1 point for a 4-letter word, 2 points for a 5-letter word, and so on.

Unless the player's input is "???", after a player's turn ends, the next turn is still a player's turn.

computer round

During the computer's turn, you'll use an algorithm to search the entire board to find the remaining words that the players missed. The computer also receives points for each word it finds that meets the requirements (meets the minimum length limit, is included in the English dictionary, has not been found by the player, and can be formed on the board).

+ You need to use a recursive algorithm to search. You can use various pruning methods to speed up the search process. For example, after finding a path starting with zx, you can use the containsPrefix member function of the dictionary to check whether there is a word starting with zx in the dictionary. If not, there is no need to continue searching for this path.

After the computer finds all remaining words, it should print two lines of information:

ÿ The first line is the score of the word found by the computer; ÿ

The second line is the list of remaining words found by the computer.

Then end the program.

dictionary information

There are more than 120,000 words considered legal in Boggle, contained in a program called

in the EnglishWords.txt file.

We provide an auxiliary class Lexicon that can be used to read the file, and provide functions such as contains and containsPrefix to help you search for words in the dictionary.

Boggle words in the game are not case sensitive. Therefore PEACE and peace and pEaCe are considered the same, but when displayed should satisfy:

ÿ In the current state, the letters on the chessboard are uppercase;

ÿ The words in the word list found by the user are all lowercase, and the words are displayed in the order they are found, that is, the ones found first Words are displayed first;

ÿ The words in the word list found by the computer are all capitalized, and the words are displayed in dictionary order from small to large.

chessboard input

In order to reduce everyone's workload and facilitate testing, the arrangement of letters on the chessboard is given by standard input.

The first line of standard input is a number N.

Each of the following N lines contains a string of length N and containing only uppercase English letters.

After the reading is completed, the game starts automatically and your program should start entering the player's turn.

Recommended writing steps

It is recommended to follow the following steps to implement the game:

ÿ First print out the current status; ÿ Write a
loop to allow the user to input multiple times; ÿ Determine whether the
user input can obtain points, including writing a recursive algorithm to detect whether the word is on the chessboard; ÿ Write a recursive algorithm to
handle the computer turn.

Submit a request

Since the content of this question is relatively simple, please write all the code in a file named "boggle.cpp" and submit only this file. This file can directly reference the "lexicon.h" file to use functions in Lexicon. The "EnglishWords.txt" file will be placed in the running working directory, so you can directly use ".

/EnglishWords.txt" as its path.

Sample

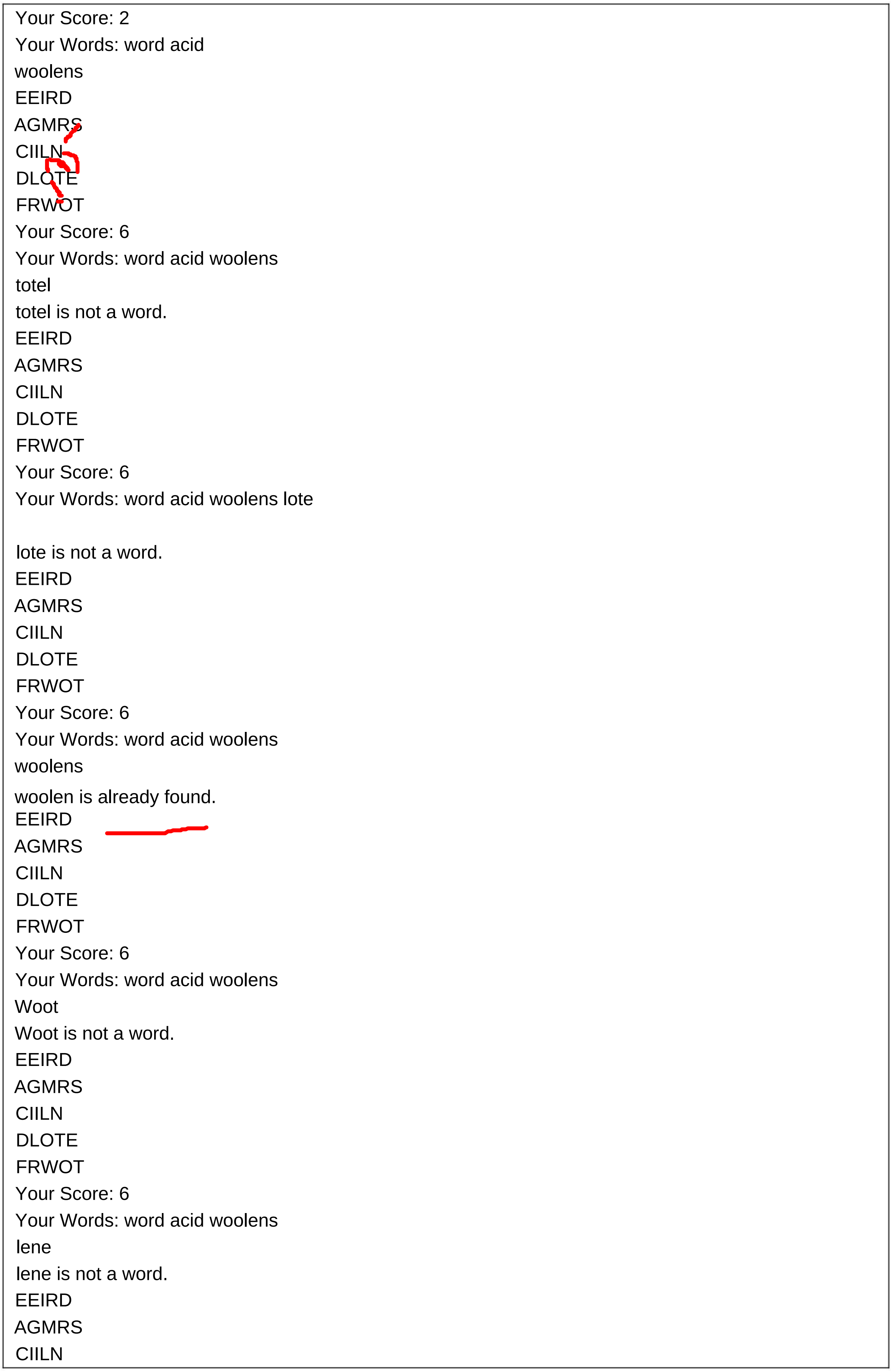
```
bash-3.2$ ./boggle.exe 5

EEIRD
AGMRS
CIILN
DLOTE
FRWOT
```

state

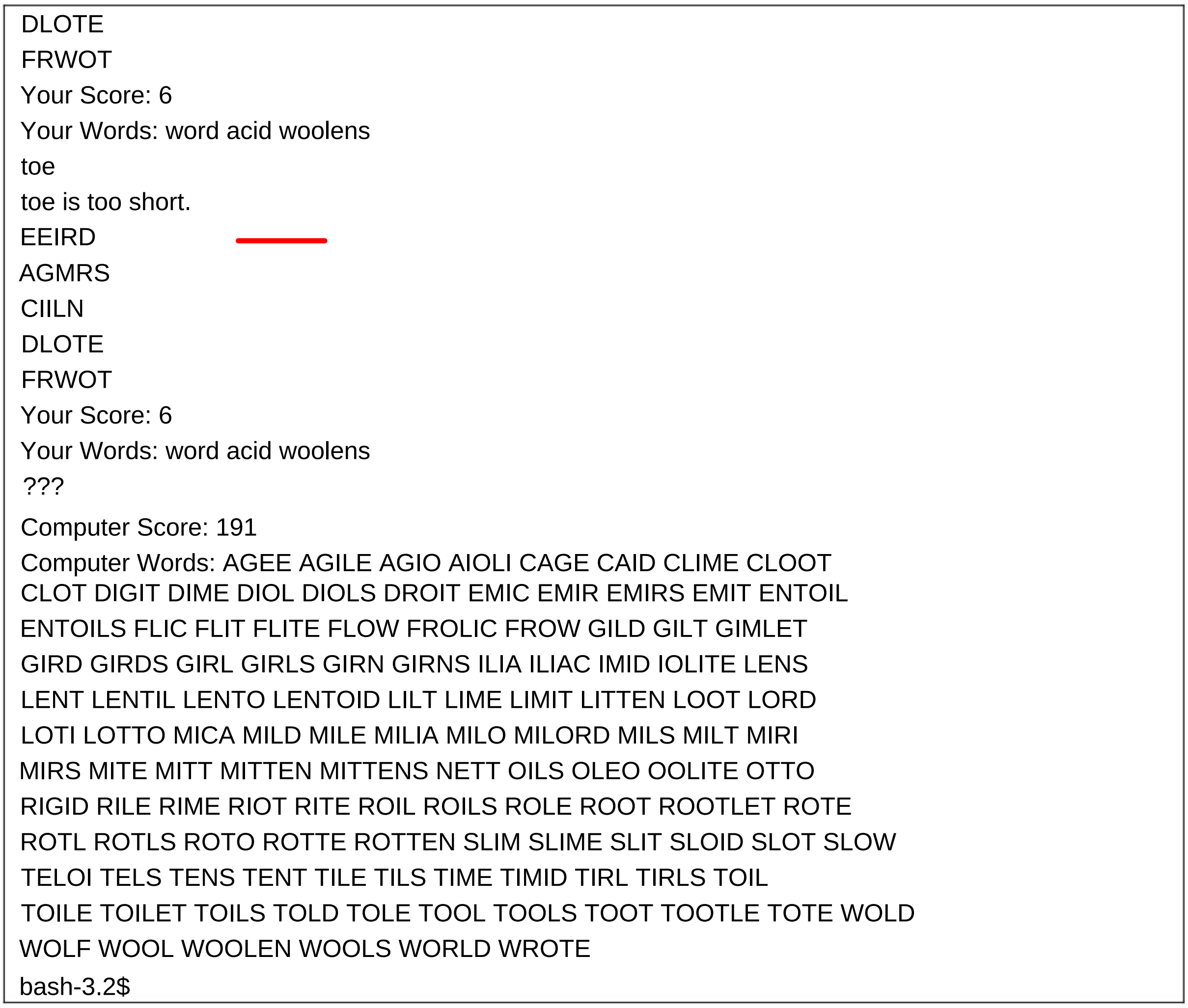
```
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 0
Your Words:
guess
guess is not on board.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 0
Your Words:
word
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 1
Your Words: word acid

EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 2
Your Words: word acid
lica
lica is not a word.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
```



```
Your Score: 2
Your Words: word acid
woolens
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens
totel
totel is not a word.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens lote

lote is not a word.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens
woolens
woolen is already found.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens
Woot
Woot is not a word.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens
lene
lene is not a word.
EEIRD
AGMRS
CIILN
```



```
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens
toe
toe is too short.
EEIRD
AGMRS
CIILN
DLOTE
FRWOT
Your Score: 6
Your Words: word acid woolens
???
Computer Score: 191
Computer Words: AGEE AGILE AGIO AIOLI CAGE CAID CLIME CLOOT
CLOT DIGIT DIME DIOL DIOLS DROIT EMIC EMIR EMIRS EMIT ENTOIL
ENTOILS FLIC FLIT FLITE FLOW FROLIC FROW GILD GILT GIMLET
GIRD GIRDS GIRL GIRLS GIRN GIRNS ILIA ILIAC IMID IOLITE LENS
LENT LENTIL LENTO LENTOID LILT LIME LIMIT LITTEN LOOT LORD
LOTI LOTTO MICA MILD MILE MILIA MILO MILORD MILS MILT MIRI
MIRS MITE MITT MITTEN MITTENS NETT OILS OLEO OOLITE OTTO
RIGID RILE RIME RIOT RITE ROIL ROILS ROLE ROOT ROOTLET ROTE
ROTL ROTLS ROTO ROTTE ROTTEN SLIM SLIME SLIT SLOID SLOT SLOW
TELOI TELS TENS TENT TILE TILS TIME TIMID TIRL TIRLS TOIL
TOILE TOILET TOILS TOLD TOLE TOOL TOOLS TOOT TOOTLE TOTE WOLD
WOLF WOOL WOOLEN WOOLS WORLD WROTE
bash-3.2$
```