CS1010E Practice Exercise: Frogs and Toads Puzzle

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Task Content

Frogs and Toads Puzzle

`N` frogs ('x') are placed on `N` successive positions on the left of a string of squares; `M` toads ('o') occupy `M` rightmost squares. On the whole, there are `M + N + 1` squares, so that just one square remains unoccupied.

Frogs only move rightward; toads move leftward. Every move is either a Slide to the nearby square or a Jump over one position, which is allowed only if the latter is occupied by a fellow of a different kind. In any case, no two animals are allowed in the same square.

The goal is to move toads into `M` leftmost positions and the frogs into `N` rightmost positions.

Example

Suppose the number of frogs `N` is 2 and the number of toads `M` is 3. A possible movement is as follows.

```
xx_ooo (Initial)
x_xooo (Frog slide)
xox_oo (Toad jump)
xoxo_o (Toad slide)
xo_oxo (Frog jump)
_oxoxo (Frog jump)
o_xoxo (Toad slide)
oox_xo (Toad jump)
ooxox_ (Toad jump)
ooxo_x (Frog slide)
oo_oxx (Frog jump)
ooo_xx (Toad slide)
```

The Task

Write a program **`frog.c`** that requests `N` and `M` from the user. `N` and `M` are integers between 1 and 10.

Sample Runs

The following are sample runs of the program. User input is underlined. Ensure that the last line of output is followed by a newline character.

```
$ ./a.out
Enter the number of frogs (N): 2
Enter the number of toads (M): 3
xx_ooo
x_xooo
xox_oo
xoxo_o
xo_oxo
_oxoxo
```

```
o_xoxo
oox_xo
ooxox_
ooxo_x
oo_oxx
ooo_xx
```

Strategy

The strategy to complete the task is as follows.

1. If only one animal can move, make such a move.
2. If one animal's move is jump while another animal's move is slide, we always choose jump.
3. If both animals' moves are jump, the configuration should be "...xo_xo...". In this case, whichever jump you choose, you will be stuck eventually (why is this so?). Such a configuration is called the fatal Jump/Jump and should be avoided.
4. If both animals' moves are slide, we will select the slide such that the next configuration you are getting is not the fatal Jump/Jump.

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