

```

1  #include "decl.h"
2  #include <stdio.h>
3  #include <stdlib.h>
4  #include <string.h>
5
6  /**
7   * Returns TRUE if the specified row and col is within the grid of cells
8   * @param row The current row
9   * @param col The current col
10  * @param maxRow The maximum row value
11  * @param maxCol The maximum col value
12  * @return TRUE if row and col is within the grid of cells
13  */
14  static bool isInRange(int row, int col, int maxRow, int maxCol)
15  {
16      return (row >= 0 && row < maxRow) && (col >= 0 && col < maxCol);
17  }
18
19  /**
20  * Returns TRUE if the cell located at the specified row and column is alive
21  * @param state The game grid
22  * @param rowOffset The specified row
23  * @param colOffset The specified column
24  * @return TRUE if the cell located at the specified row and column is alive
25  */
26  static bool isAlive(char *state, int rowOffset, int colOffset)
27  {
28      return *(state + rowOffset + colOffset) == ALIVE_CELL;
29  }
30
31  /**
32  * Counts the number alive cells adjacent to the specified cell.
33  * @param row The row of the cell.
34  * @param col The column of the cell.
35  * @param maxRow The maximum row index.
36  * @param maxCol The maximum col index.
37  */
38  static int countAdjacentAliveCells(char *state, int row, int col, int maxRow, int maxCol)
39  {
40      int rowOffset = 0, colOffset = 0, aliveCount = 0;
41      char charAtOffset;
42
43      /*This iterates over every adjacent cell in a 3x3 by offsetting the current cell*/
44      for (int i = -1; i <= 1; i++) {
45          for (int j = -1; j <= 1; j++) {
46              /*If i and j are both 0, there is no offset so skip it*/
47              if(i == 0 && j == 0) {continue;}
48
49              if (isInRange(row + i, col + j, maxRow, maxCol)) {
50                  rowOffset = (row + i) * maxRow;
51                  colOffset = col+j;
52                  charAtOffset = *(state + rowOffset + colOffset);
53
54                  if (isAlive(state, rowOffset, colOffset)){
55                      aliveCount++;
56                  }
57              }
58          }
59      }
60      return aliveCount;
61  }
62
63  /**
64  * This method advances the state of the board and returns true if there is another
65  * generation
66  * to occur. That is, not every cell is dead.
67  * @param state The current state.
68  * @param nextState the next state of the grid.
69  * @param rows The number of rows in the grid.

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69  * @param cols The number of columns in the grid.
70  * @return TRUE if there are alive cells in the next generation.
71  */
72  bool generations(char *state, char *nextState, int rows, int cols)
73  {
74      int aliveCount = 0;
75      bool hasAliveCells = FALSE;
76
77      for (int i = 0; i < rows; i++) {
78          for (int j = 0; j < cols; j++) {
79              aliveCount = countAdjacentAliveCells(state, i, j, rows, cols);
80
81              if (aliveCount > 0) {hasAliveCells = TRUE;}
82              *(nextState + rows * i + j) = *(state + rows * i + j);
83
84              if (isAlive(state, rows * i, j)) {
85                  if (aliveCount < 2 || aliveCount > 3) {
86                      *(nextState + rows * i + j) = DEAD_CELL;
87                  }
88              }
89              else {
90                  if (aliveCount == 3) {
91                      *(nextState + rows * i + j) = ALIVE_CELL;
92                  }
93              }
94          }
95      }
96      return hasAliveCells;
97  }

```