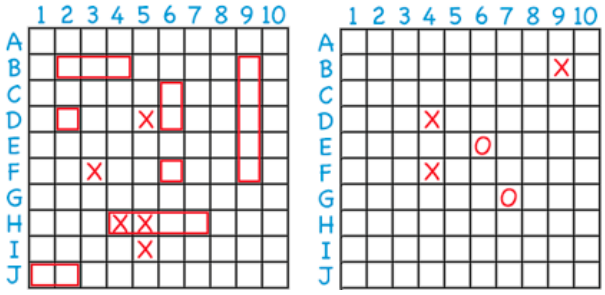
Matei-Sorin AXENTE (66967) - Battle Ships

Autorul poate fi contactat la adresa: **Login pentru adresa**

Introducere

Proiectul consta in crearea unei console pentru clasicul joc **Battle Ships** pentru doi jucatori, folosind doua matrici de LED-uri 8×8 RGB.



Ideea a venit de la un proiect din anii trecuti care implementa jocul Snake pe o matrice de LED-uri.

Utilitatea principala a proiectului este distractia si relaxarea printr-un joc clasic.

Descriere generală

Fiecare jucator va avea cate 5 butoane, 4 pentru deplasarea navelor in prima faza/mutarea cursorului pentru atac si unul pentru plasare nava/atac. Butoanele modifica starile matricilor de LED-uri prin deplasarea cursorului sau marcarea atacurilor, acestea alcatuind tabla de joc. Cardul SD va stoca efectele de sunet, ce vor insoti actiunile jucatorilor, in special atacurilor. LCD-ul text va tine scorul (nr casute ocupate de nave lovite de fiecare jucator) si va indruma jucatorii.

Functionalitate

La inceput, fiecare jucator isi va plasa setul de nave, de diferite dimensiuni, folosind 4 butoane pentru a se deplasa pe careul de 8×8 si un al cincilea buton pentru a confirma plasarea navei in acea pozitie.

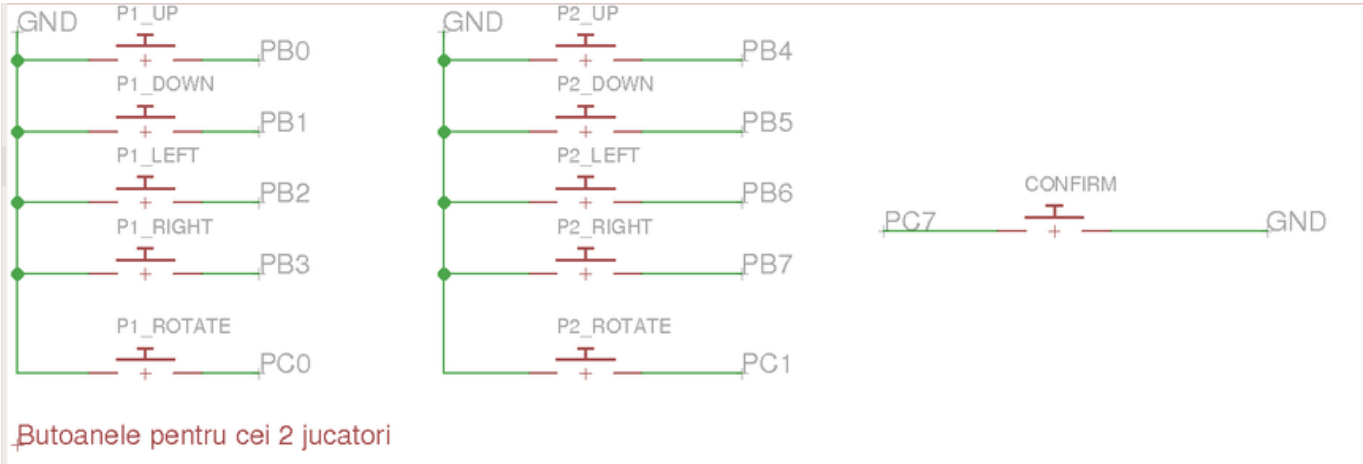
Cand ii vine randul, jucatorul activ va avea afisate atacurile precedente, pe matricea sa de LED-uri, alaturi de un cursor cu care va alege urmatorul atac. Jucatorul inactiv, va avea pe matricea de LED-uri

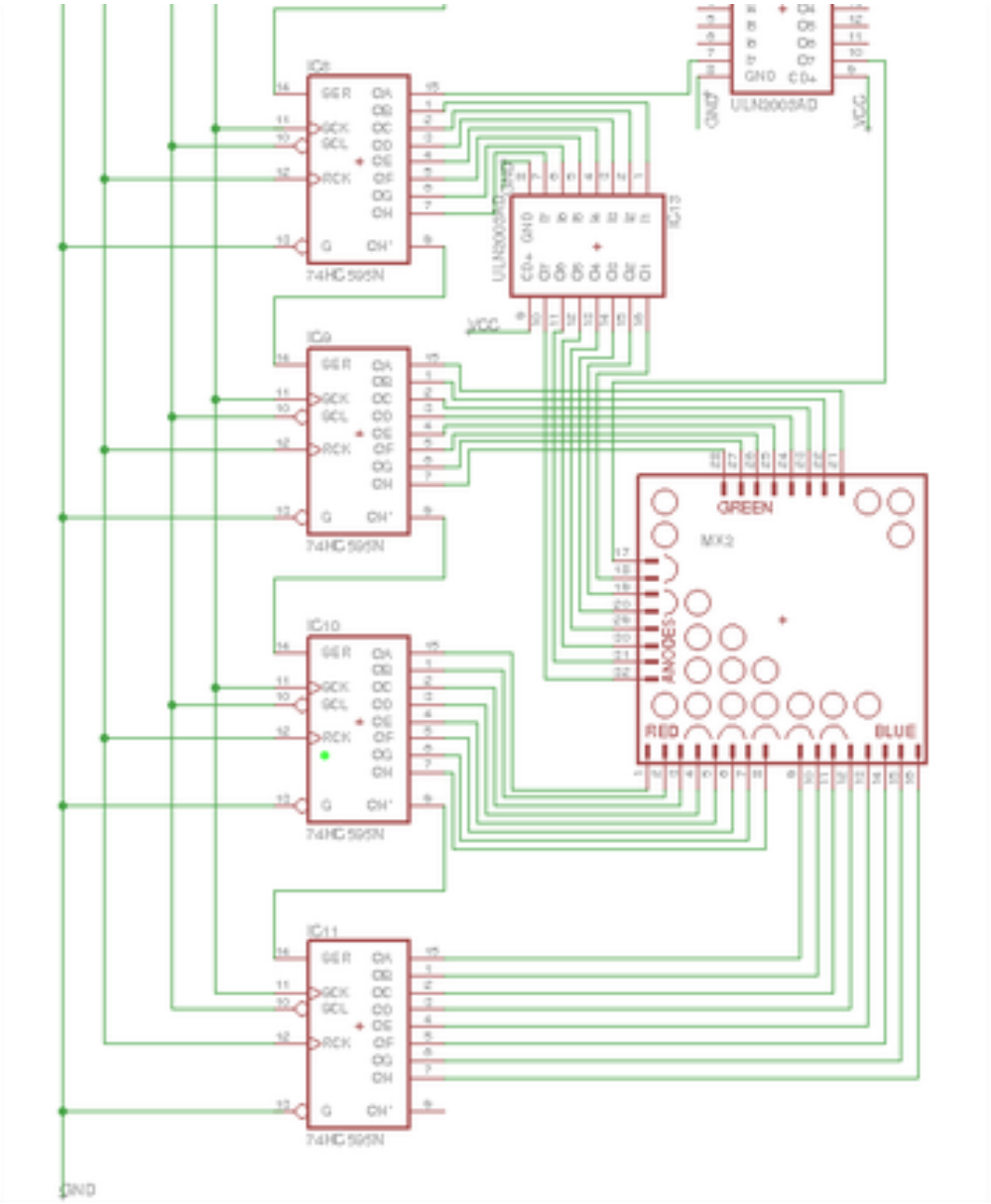
navele sale si atacurile adversarului.

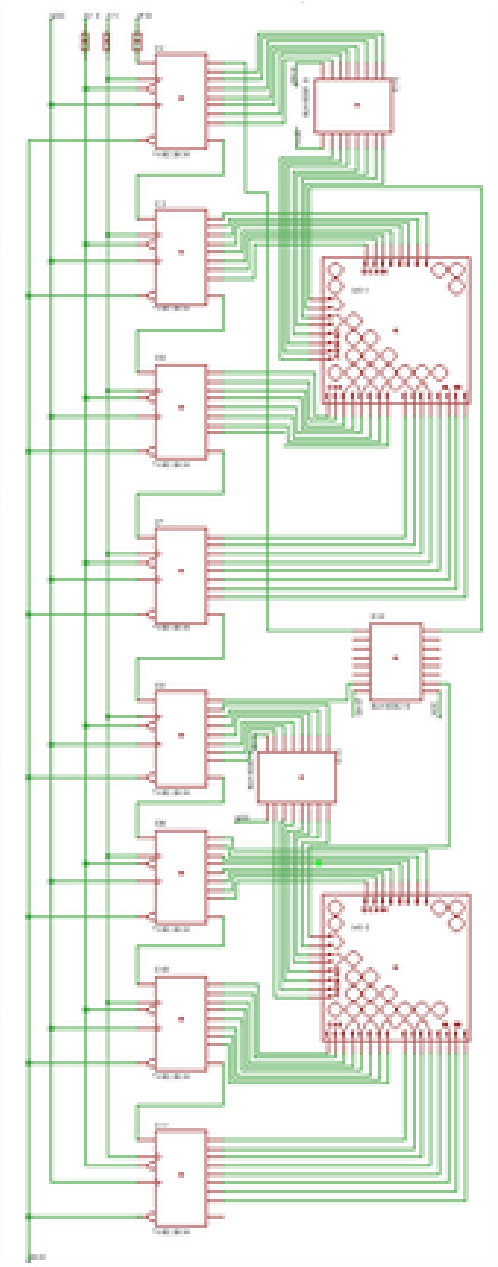
Jocul se termina cand un jucator reuseste sa distruga toate navele adversarului (loveste fiecare casuta ocupata de o nava).

Hardware Design

- Placa de baza x 1
- Matrice LED-uri 8×8 RGB x 2
- Butoane (diverse tipuri) x 10
- LCD text 16×2 x 1
- Shift Register 8 biti x 8
- Matrice tranzistoare x 3
- Buzzer x 1
- SD Card x 1




IC8
IC9
IC10
IC11
74HC595N
ULN2003AD
IC13
VCC
GND
MX2
GREEN
RED
BLUE
ANODES



Software Design

Varianta Linux cu citire de la tastatura

```
#include <stdio.h>
#include <stdlib.h>

#define EMPTY '.'
#define TOBE  'o'
#define SHIP  'O'

#define       AIM        '+'
#define HIT   'X'
#define MISS  'w'
```

```
void initMatrix(char ****m) {
        int p, i, j;

        *m = (char ***)malloc(2 * sizeof(char **));

        for(p = 0; p < 2; p++) {
                (*m)[p] = (char **)malloc(8 * sizeof(char *));
                for(i = 0; i < 8; i++)
                        (*m)[p][i] = (char *)malloc(8 * sizeof(char));

                for(i = 0; i < 8; i++)
                        for(j = 0; j < 8; j++)
                                (*m)[p][i][j] = EMPTY;
        }
}

void clearMatrix(char ****m) {
        int p, i;
        for(p = 0; p < 2; p++) {
                for(i = 0; i < 8; i++)
                        free((*m)[p][i]);
                free((*m)[p]);
        }
        free(*m);
}

void printMatrix(char **m) {
        int i, j;
        for(i = 0; i < 8; i++) {
                for(j = 0; j < 8; j++)
                        printf("%c ", m[i][j]);
                printf("\n");
        }
}

void printBoth(char ***m) {
        int i, j;

        printf("\n");
        for(i = 0; i < 40; i++)
                printf("-");
        printf("\n");

        for(i = 0; i < 8; i++) {
                for(j = 0; j < 16; j++) {
                        if(j == 8)
                                printf("\t");

                        if(j < 8)
                                printf("%c ", m[0][i][j]);
```

```
                        else
                                printf("%c ", m[1][i][j - 8]);
                }
                printf("\n");
        }

        for(i = 0; i < 40; i++)
                printf("-");
        printf("\n\n");
}

void switchPlayer(int *p) {
        *p = *p == 0 ? 1 : 0;
}

int placeShip(char ***m, int size, int *x, int *y, int dir) {
        int i = 0, rez = 1;
        if(dir == 1) {
                if(*x > 8 - size)
                        *x = 8 - size;

                for(i = 0; i < size; i++)
                        if((*m)[*x + i][*y] != SHIP)
                                (*m)[*x + i][*y] = TOBE;
                        else
                                rez = 0;
        }
        else {
                if(*y > 8 - size)
                        *y = 8 - size;

                for(i = 0; i < size; i++)
                        if((*m)[*x][*y + i] != SHIP)
                                (*m)[*x][*y + i] = TOBE;
                        else
                                rez = 0;
        }

        return rez;
}

void removeShip(char ***m) {
        int i, j;
        for(i = 0; i < 8; i++)
                for(j = 0; j < 8; j++)
                        if((*m)[i][j] == TOBE)
                                (*m)[i][j] = EMPTY;
}

void replace(char ***m) {
        int i, j;
```

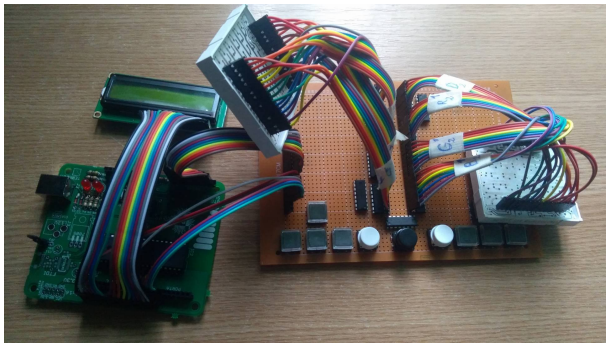
```
        for(i = 0; i < 8; i++)
                for(j = 0; j < 8; j++)
                        if((*m)[i][j] == TOBE)
                                (*m)[i][j] = SHIP;
}

int aim(char ***hits, char **opp, int x, int y) {
        if((*hits)[x][y] == EMPTY) {
                (*hits)[x][y] = AIM;
                return 1;
        }
        else
                return 0;
}

void check(char ***hits, char **opp, int x, int y, int *left) {
        if(opp[x][y] == SHIP) {
                (*hits)[x][y] = HIT;
                (*left)--;
        }
        else
                (*hits)[x][y] = MISS;
}

int main() {
        char action='\0', to;
        int i = 0, j = 0, change = 0, rez = 0;
int rep = 0;

        int p = 0;

        char ***own;
        initMatrix(&own);

        char ***opp;
        initMatrix(&opp);

        int ships[6] = {4, 3, 3, 2, 2, 2};
        int placed[2] = {6 ,6};
        int dir[2] = {0, 0};

        int left[2] = {16, 16};

        rez = placeShip(&own[p], ships[6 - placed[p]], &i, &j, dir[p]);

        while(placed[p] > 0) {
                printBoth(own);

                scanf("\n\n\n%c", &action);

                if(action == 'q')
```

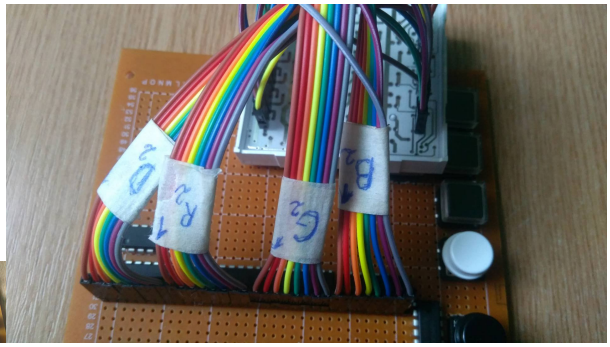
```
                        break;
                else if(action == 'c') {
                        if(rez) {
                                replace(&own[p]);
                                placed[p]--;
                                switchPlayer(&p);
                                change = 1;
                                i = 0;
                                j = 0;
                                rez = placeShip(&own[p], ships[6 -
placed[p]], &i, &j, dir[p]);
                        }
                        else
                                printf("Invalid position\n");
                }
                else if(action == 'm') {
                        if(left[p]) {
                                removeShip(&own[p]);

                                scanf(" %c", &to);

                                switch(to) {
                                case 's': i = (i < 8 ? i + 1 : 7);
break;
                                case 'w': i = (i > 0 ? i - 1 : 0);
break;
                                case 'd': j = (j < 8 ? j + 1 : 7);
break;
                                case 'a': j = (j > 0 ? j - 1 : 0);
break;
                                }

                                rez = placeShip(&own[p], ships[6 -
placed[p]], &i, &j, dir[p]);
                        }
                }
                else if(action == 'r' && placed[p]) {
                        removeShip(&own[p]);

                        dir[p] = dir[p] == 0 ? 1 : 0;
                        rez = placeShip(&own[p], ships[6 - placed[p]],
&i, &j, dir[p]);
                }
        }

        action = '\0';

        i = 0;
        j = 0;
        rez = aim(&opp[p], own[1 - p], i, j);
```

```
        while(left[p] > 0) {
                printf("SCORE: p1 - %d/16\tp2 - %d/16\n", left[0], left
[1]);
                printBoth(own);
                printBoth(opp);

                scanf("\n\n\n%c", &action);

                if(action == 'q')
                        break;
                else if(action == 'c') {
                        if(rez) {
                                check(&opp[p], own[1 - p], i, j, &left[
1 - p]);
                                switchPlayer(&p);
                                change = 1;
                                i = 0;
                                j = 0;
                                rez = aim(&opp[p], own[1 - p], i, j);
                        }
                        else
                                printf("Invalid position\n");
                }
                else if(action == 'm') {
                        if(left[p]) {
                                if(opp[p][i][j] == AIM)
                                        opp[p][i][j] = EMPTY;

                                scanf(" %c", &to);

                                switch(to) {
                                case 's': i = (i < 8 ? i + 1 : 7);
break;
                                case 'w': i = (i > 0 ? i - 1 : 0);
break;
                                case 'd': j = (j < 8 ? j + 1 : 7);
break;
                                case 'a': j = (j > 0 ? j - 1 : 0);
break;
                                }

                                rez = aim(&opp[p], own[1 - p], i, j);
                        }
                }
        }

        printf("!!!!!WINNER!!!!!\n----PLAYER %d----\n", 1 - p);

        clearMatrix(&own);
        clearMatrix(&opp);
```

```
        return 0;
}
```

Rezultate Obţinute





Concluzii

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Jurnal

Bibliografie/Resurse

- Documentația în format PDF

Shift Registers SN74HC595.pdf

Tranzistor Matrix ULN2003.html

8×8 RGB LED Matrix