Project 1 - C++ - Jakub Kondracki ID:188767

Our task was to implement a 2D world and make its visualization. I've made the requirements which are needed for 5 points. I've implemented:

- The whole world and its visualization.
- 5 Animal classes with breeding Antelope, Fox, Wolf, Turtle and Sheep
- 5 Plant classes with sawing Guarana, Sosnowsky's hogweed, Grass, Belladonna and sow thistle
- A human (player) which is moving by clicking the arrow keys.
- A human's special ability in my case it is Immortality
- Saving and loading state of the world to file and from file.

When we click start a window appears on which my name, second name and index appears. Then we can see small introduction to the game which in short presents what is the point of the game. And in the end we can see a menu with 2 options. Loading a game with clicking 'R' button and creating a new game by clicking 'N' button. After clicking 'N' your job is to write the size of the board. For example if you want a board 20x20 then you need to write "20 20".

```
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Made by Jakub Kondracki ID:188767
Hello! Welcome to Game Of Life
Your task is to survive as long as possible as a human.
In this world you can meet some animals and also various plants.
However you have to be careful because there are many organisms that are stronger t
han you
and can kill you if you collide with them
Remember also that even if you die, the game doesn't end and you can watch other an
imals living their own lives.
In any moment you can save the game by clicking S. Just remember to do it before th
e beginning of a turn.
Otherwise there will be no such possibility
Menu:
 ) Load the game
  New Game
```

After clicking new game:

```
Menu:
R) Load the game
N) New Game
Type in the size of the board (N x M): _
```

And here's the implementation of this menu in C++:

```
fine READ 114
fine NEW 110
srand(time(NULL));
int n, m;
char choice1 = NULL;
char choice2 = NULL;
bool loaded = true;
cout << "Made by Jakub Kondracki ID:188767" << endl << endl;
cout << "Hello! Welcome to Game Of Life" << endl << endl;
cout << "Your task is to survive as long as possible as a human." << endl;
cout << "In this world you can meet some animals and also various plants." << endl;
cout << "However you have to be careful because there are many organisms that are stronger than you " << endl << "and can kill you if you collide with them" << endl;
cout << "Remember also that even if you dis, the game doesn't end and you can watch other animals living their own lives." << endl;
cout << "In any moment you can save the game by clicking S. Just remember to do it before the beginning of a turn." << endl;
cout << "Otherwise there will be no such possibility" << endl << endl;
cout << "Menu:" << endl;
cout << "R) Load the game" << endl;
cout << "N) New Game" << endl;</pre>
       World* world = nullptr;
Generator* generator = nullptr;
                              wcab.
world = new World();
generator = new Generator(world);
if (!generator->LoadWorld())
                           {
  cout << "Type in the size of the board (N x M): ";
  cin >> n >> m;
  system("cls");
} while (n * m < (AllSpecies + FreeSpace));</pre>
                           world = new World(n, m);
generator = new Generator(world);
generator->GenerateWorld();
break;
                             cout << "Wrong key, please try again" << endl;</pre>
       } while ((choice1 != READ || !loaded) && choice1 != NEW);
```

When you type in the size of the board then you are moved to your unique 2D world which contains:

- Information about author.
- Information about the turn of the game.
- Option to create a new game
- Option to save a world to a file
- Visualization of the world
- Information about all events which happened in this turn.

To make a turn player has to press ENTER button. After clicking it, on the bottom of the screen we can see a instruction how to turn on immortality (which lasts for 5 rounds) and also how to move a human.

```
Every animal has a different index:
Human: 'X'
                                Grass: 'g'
Fox: 'F'
                                Sow Thistle: 'm'
Antelope: 'A'
                               Belladonna: 'b'
Wolf: 'W'
                               Sosnowsky's hogweed: 's'
Turtle: 'T'
                               Guarana: 'G'
Sheep: 'S'
```

Here is an example on the 10x10 world:

Zero turn (creating a world):

C:\Osers\kubak\Desktop\ProjektT\C++\X04\Debug\ProjektTiexe

```
Made by Jakub Kondracki ID:188767
Turn: 0
N) New game
Save progress
To start a turn press ENTER
%%%%%%%%%%%%%%%
%F T
          S%
% GT
         A %
      W b%
%s
% FA
     GF Ab%
          %
 Sb X
% mWG
        W %
%m g
          %
   gT ms %
Human: creating new organism (5, 6)
Wolf: creating new organism (3, 7)
Sheep: creating new organism (2, 6)
Fox: creating new organism (2, 4)
Turtle:
               creating new organism (4, 2)
               creating new organism (3, 4)
Antelope:
Grass: creating new organism (4, 9)
Sow Thistle: creating new organism (2, 7)
Guarana:
               creating new organism (4, 7)
Belladonna:
               creating new organism (10, 3)
Sosnowsky hogweed:
                       creating new organism (8, 9)
Wolf: creating new organism (9, 7)
Sheep: creating new organism (1, 10)
Fox: creating new organism (7, 4)
Turtle:
              creating new organism (5, 9)
              creating new organism (9, 2)
Antelope:
Grass: creating new organism (2, 5)
Sow Thistle:
              creating new organism (7, 9)
                creating new organism (3, 2)
Guarana:
           creating new organism (10, 4)
Belladonna:
Sosnowsky hogweed:
                       creating new organism (7, 5)
Wolf: creating new organism (7, 3)
Sheep: creating new organism (10, 1)
Fox:
       creating new organism (1, 1)
Turtle:
               creating new organism (3, 1)
```

Clicking ENTER:

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```
Human: creating new organism (5, 6)
Wolf:
       creating new organism (3, 7)
Sheep: creating new organism (2, 6)
Fox: creating new organism (2, 4)
Turtle:
               creating new organism (4, 2)
Antelope:
               creating new organism (3, 4)
Grass: creating new organism (4, 9)
Sow Thistle: creating new organism (2, 7)
Guarana:
               creating new organism (4, 7)
Belladonna:
               creating new organism (10, 3)
Sosnowsky hogweed:
                       creating new organism (8, 9)
Wolf: creating new organism (9, 7)
Sheep: creating new organism (1, 10)
Fox: creating new organism (7, 4)
Turtle:
               creating new organism (5, 9)
Antelope:
              creating new organism (9, 2)
Grass: creating new organism (2, 5)
Sow Thistle: creating new organism (7, 9)
              creating new organism (3, 2)
Guarana:
               creating new organism (10, 4)
Belladonna:
Sosnowsky hogweed:
                    creating new organism (7, 5)
Wolf: creating new organism (7, 3)
Sheep: creating new organism (10, 1)
Fox:
       creating new organism (1, 1)
Turtle:
               creating new organism (3, 1)
Antelope:
               creating new organism (9, 4)
Grass: creating new organism (3, 8)
Sow Thistle: creating new organism (1, 8)
Guarana:
               creating new organism (6, 4)
             creating new organism (3, 6)
Belladonna:
Sosnowsky hogweed:
                       creating new organism (1, 3)
To activate Immortality press I
Move your character by one of the arrow keys (You are 'X')
```

When you turn on immortality, a message will show up, confirming that our ability is activated.

```
Belladonna: sawing the plant trom (10, /) na pole (10, 6)

To activate Immortality press I

Move your character by one of the arrow keys (You are 'X')

Immortality activated
```

First turn:

C:\Osers\kubak\Desktop\ProjektT C++\x04\Debug\ProjektT.exe

```
Made by Jakub Kondracki ID:188767
Turn: 1
N) New game
S) Save progress
To start a turn press ENTER
As we can see, world has changed
            S%
                                                                     because animals have moved to
        Wbb%
                                                                     another positions and some of the
            b%
% g
% g
                                                                     plants died because of consumption
           W %
  b
 S GX
                                                                     by animals.
              %
%m W
              %
    gT ms
Fox:
          moving from (2, 4) to (2, 3)
         moving from (7, 4) to (6, 4)
Fox:
Fox:
         attacked Guarana
Guarana:
                    enhancement of Fox by 3 points
organism died
Fox: moving from (1, 1) to (1, 2)
Wolf: moving from (3, 7) to (3, 8)
Wolf: attacked Grass
                   organism died
Grass: organism died
Wolf: moving from (9, 7) to (9, 6)
Wolf: moving from (7, 3) to (8, 3)
Human: moving from (5, 6) to (5, 7)
Sheep: moving from (2, 6) to (2, 7)
Sheep: attacked Sow Thistle
Sow Thistle: organism died
                moving from (3, 4) to (3, 2)
attacked Guarana
enhancement of Antelope by 3 points
Antelope:
Antelope:
Guarana:
                   organism died
Guarana:
Sheep: moving from (1, 10) to (2, 10)
Antelope: moving from (9, 2) to (7, 2)
Sheep: moving from (10, 1) to (10, 2)
                   moving from (9, 4) to (7, 4) moving from (4, 2) to (4, 3)
Antelope:
Turtle:
Belladonna:
                    creating new organism (9, 3)
```

When it comes to reproduction of animals, this event will happened if two animals of the same species will collide with each other.

And sawing happens with a certain probability:

Probability of sawing for each plant:

- For grass it is 50% that sawing will success (It is easy to saw)
- For guarana it is 20% chance of success
- For Sosnowsky's hogweed it is 15% chance
- For belladonna it is 20% chance
- For sow thistle it is 30% chance, but it has 3 chances to spread in each turn

Sawing at practice:

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```
N) New game
S) Save progress
To start a turn press ENTER
%%%%%%%%%%%%%%
     G
   b
      S T %
%W bSWb gg %
      bgggG%
      bbm %
  F smm X%
 A gg TW %
    mgs
            %
    ms
            %
    m G
%%%%%%%%%%%%%%
        moving from (3, 5) to (3, 6)
        moving from (9, 8) to (9, 7)
Wolf:
        moving from (1, 2) to (1, 3)
Wolf:
        moving from (4, 3) to (5, 3)
Wolf:
Human: moving from (10, 7) to (10, 6)
Human: attacked Turtle
Turtle:
                 organism died
Sheep: moving from (4, 4) to (4, 3)
                 moving from (5, 4) to (5, 6)
Antelope:
Antelope: moving from (2, 9) to (2, 7)
Sheep: moving from (8, 2) to (7, 2)
                                                                       Example of sawing
Sheep: attacked Antelope
                 organism died
Antelope:
Turtle:
                 moving from (9, 1) to (9, 2)
Grass: creating new organism (9, 3)
Grass: sawing the plant from (9, 4) na pole (9, 3)
Grass: creating new organism (6, 7)
Grass: sawing the plant from (5, 7) na pole (6, 7)
Sosnowsky hogweed:
                       attacked Antelope
Antelope:
                 organism died
Sow Thistle:
                 creating new organism (7, 6)
Sow Thistle:
                sawing the plant from (8, 6) na pole (7, 6)
Grass: creating new organism (7, 4)
Grass: sawing the plant from (8, 4) na pole (7, 4)
Sow Thistle: creating new organism (4, 8)
                sawing the plant from (4, 9) na pole (4, 8)
Sow Thistle:
Belladonna: creating new organism (6, 3)
Belladonna: sawing the plant from (6, 4) na pole (6, 3)
```

Reproduction in practice:

```
Wolf: moving from (1, 2) to (1, 3)
Wolf: attacked Wolf
Wolf: creating new organism (1, 1)
Organism reproducted
```

And the last thing to show is saving the progress of our world to the file and loading it in our game:

```
Made by Jakub Kondracki ID:188767
Turn: 4

    New game

S)Save progress
                                             To save our progress we need to
To start a turn press ENTER
                                             press s before the turn starts.
%%%%%%%%%%%%%%%%
%W Ab mmGGG %
            g%
   bmmmmG
%gW G m
           gg%
%gg bbb
          Sgg%
           gg%
%gggSW
        GG g %
  g
 s
             W%
       Gmm
%smmmF
       Gmmm
       s mmmb%
    mmmmmmmb%
moving from (5, 9) to (5, 10)
Fox:
        moving from (9, 8) to (8, 8)
ox:
        moving from (12, 7) to (12, 8)
ox:
                                                       When we click 'S', on the bottom of
wolf:
        moving from (1, 2) to (1, 3)
        attacked Wolf
wolf:
                                                       our screen we can see a
        creating new organism (1, 1)
                                                       confirmation that we saved our
Organism reproducted
                                                       game
 Sow Thistle:
                   sawing the plant from (10, 11) na pole (11, 11)
                   creating new organism (4, 12) sawing the plant from (5, 12) na pole (4, 12)
 Sow Thistle:
 Sow Thistle:
 Game was saved
```

Our progress of the game is saved in the file which is called "dane.txt":

```
Wstawianie
                                                    Edytowanie
[3 ⋅ 1 ⋅ 2 ⋅ 1 ⋅ 1 ⋅ 1 ⋅ 2 ⋅ 1 ⋅ 1 ⋅ 1 ⋅ 2 ⋅ 1 ⋅ 3 ⋅ 1 ⋅ 4 ⋅ 1 ⋅ 5 ⋅ 1 ⋅ 6 ⋅ 1 ⋅ 7 ⋅ 1 ⋅ 8 ⋅ 1 ⋅ 9 ⋅ 1 ⋅ 10 ⋅ 1 ⋅ 11 ⋅ 12 ⋅ 1 ⋅ 13 ⋅ 1 ⋅ 14 ⋅ ½ 15 ⋅ 1 ⋅ 16 ⋅ 1 ⋅ 17 ⋅ 1
              12 12 4 73
              Fox 3 7 5 10 4
              Wolf 9 5 1 2 4
              Wolf 9 5 5 5 4
              Wolf 9 5 2 3 4
              Wolf 9 5 12 8 4
              Wolf 9 5 1 1 1
              Human 5 4 3 11 4 0 9
              Antelope 4 4 3 1 4
              Sheep 4 4 4 5 4
              Sheep 4 4 10 4 4
              Turtle 2 1 4 8 4
              Grass 0 0 12 5 4
              Sow Thistle 0 0 8 10 4
              Guarana 0 0 7 9 4
              Belladonna 99 0 5 4 4
              Sosnowsky hogweed 10 0 7 8 4
              Grass 0 0 2 4 4
              Sow Thistle 0 0 8 12 4
              Guarana 0 0 4 3 4
              Belladonna 99 0 4 1 4
              Sosnowsky hogweed 10 0 1 10 4
              Grass 0 0 11 5 4
              Sow Thistle 0 0 6 2 4
              Guarana 0 0 9 1 4
              Belladonna 99 0 6 4 4
              Sosnowsky hogweed 10 0 2 7 4
              Sow Thistle 0 0 2 10 4
              Guarana 0 0 9 6 4
              Belladonna 99 0 12 12 4
              Sosnowsky hogweed 10 0 7 11 4
              Sow Thistle 0 0 9 10 3
              Guarana 0 0 7 10 3
```

And we can load it by clicking "Load the game" on the first screen:

```
Remember also that even it you die, the game doesn to In any moment you can save the game by clicking S. Ju Otherwise there will be no such possibility

Menu:

R) Load the game

N) New Game
```

Loading the game:

```
N) New Game
Game was loaded
```

And the result:

```
Turn: 4
N) New game
S) Save progress
To start a turn press ENTER
%%%%%%%%%%%%%%%%
%W Ab mmGGG %
%W bmmmmG g%
%gWGmgg%
%gg bbb Sgg%
%gggSW gg%
% g GG g %
% s
% Ts W%
% m Gmm %
%smmmF Gmmm %
% X s mmmb%
% mmmmmmmmb%
9999999999999999
Fox: creating new organism (5, 10)
Wolf: creating new organism (1, 2)
Wolf: creating new organism (5, 5)
Wolf: creating new organism (2, 3)
Wolf: creating new organism (12, 8)
Wolf: creating new organism (1, 1)
Human: creating new organism (3, 11)
           creating new organism (3, 1)
Antelope:
```