Final Report

Igel Argern Game Arcade Simulation

Group 3: Mystery Knights

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Table of Contents

Description

About the Game

Igel Argern is a German board game, loosely translated as “Hedgehogs in a Hurry”, designed by Frank Netsel. This is sort of a racing game between 2- 6 players where the player to get all their hedgehogs to the end first will win the game. The playing material consists of a game board with 6 tracks, each 9 columns long, and 4 hedgehogs with the same unique color per player. In the game board, there are different type of squares where the hedgehogs will move along on: The “start” square, the initial square where all the hedgehogs are placed, “End” or “Ziel” square, is the end of the track, normal square, and a variety of obstacle squares to block the hedgehogs.

The Arcade Simulation

For the simulation, the user will input the simulation time and the output file *name* to store the timing wheel of games being scheduled in the arcade. Then the program will initialize the arcade with 3 game tables, a timing wheel with the max delay duration of 10, and schedule the game tables at different time instances with a random number of players. The output of the program will display the game table being scheduled at each time instance as well as displaying and writing the timing wheel with some stats to the output file inputted by the user.

Structure Overview of the Igel Argern Game

Overall we use a high level of separation of private data members from public accessor methods to structure our game. There is frequent use of constructor specialization and assignment operator overloading to ensure that we can more easily work with our game objects. There's a heavy use of pointers and iterators to refer to and work with various STL containers. Below is a high level overview of our program.

Main Program
Allows the user to choose between Single Game Mode & Arcade Mode by calling initialization functions of each respective instantiated class

Single Game Mode
This option allows the user to play one game of Igel Argern or iterate through many games, one at a time, while choosing options to display information to the screen or just print the final winner. The GameDriver class initiates the game through the GameTable class which then calls on the

Game itself. We use composition through each of these levels between main.cpp, GameDriver, GameTable, and Game.

The GameTable Class

- -Initializes the number of players
- -Creates the players using a vector of player pointers
- -Adds the players to the games vector of player pointers
- -Starts the game

The Board Class

The Board Class is the structure upon which the game class operates. We use composition to access the board object

Core Board Functions

- Create the Board Matrix as a vector of vectors to Square Pointers
- Display the contents of the board
- Allow retrieval of info and access to the Square objects
- We use inheritance to randomly create a variety of traps in different columns and different rows on the board

The Square & Trap Classes

The key function of the Square Class is to provide and abstract foundation for a container of Hedgehogs

- The containers vary depending on the type of Square: Regular or Trap Square: Normal Trap, Shallow Pit, Deep Pit, Blackhole, Wormhole
- We use a variety of containers ranging from queues to stacks
- Regular Square derives from Square
- Trap Derives from Square and contains virtual functions
- All sub traps derive from Trap

The Player & Hedgehog Classes

Each player has a vector of Hedgehog pointers which are then associated with the Player's ID and color. Each hedgehog derives its main information from the player that contains it.

The Game Class

6 responsibilities that make heavy use of STL template classes to cycle through relevant player, hedgehog, and square vectors

- Layout the hedgehogs on the board: We use a series of vectors create a specialized layout logic to place all hedgehogs in the appropriate column
- Manage player rounds: We use a variety of loop functions

- Roll The Dice
- Get SideStep Move
    - We cycle through the current player's hedgehog to find a random hedgehog to move up or down or not move at all
- Get Player Move
    - We cycle through the hedgehogs on the track to determine which hedgehog to move
    - Trap Management
- Determine the winner
    - We cycle through all of the hedgehogs in the last column to total the hedgehogs per player to determine a winner

ArcadeSimulation Class

The ArcadeSimulation Class initializes the timing wheel and starts the timing wheel's schedule function

The TimingWheel Class

- Initializes the timingWheel
- Creates an object array of Partitions pointers for use as timing wheel slots
- Runs the iterations by cycling through all of the partition pointers in a given slot
- Each iteration calls on the GameTable class to initiate a new game
- Tally the results at the end and output to the console and to a chosen file

Partition Class

Points to a GameTable pointer and to another Partition Pointer

Feature List

Main, ArcadeSimulation, GameDriver

- Choosing the game mode: Single Game or Arcade Mode

ArcadeSimulation

- Outputting to a log file
- Entering the number of simulations

Single Game Mode

- Choose number of players: Random or user input
- Choose number iterations to run
- Choose to display or not display each rounds output

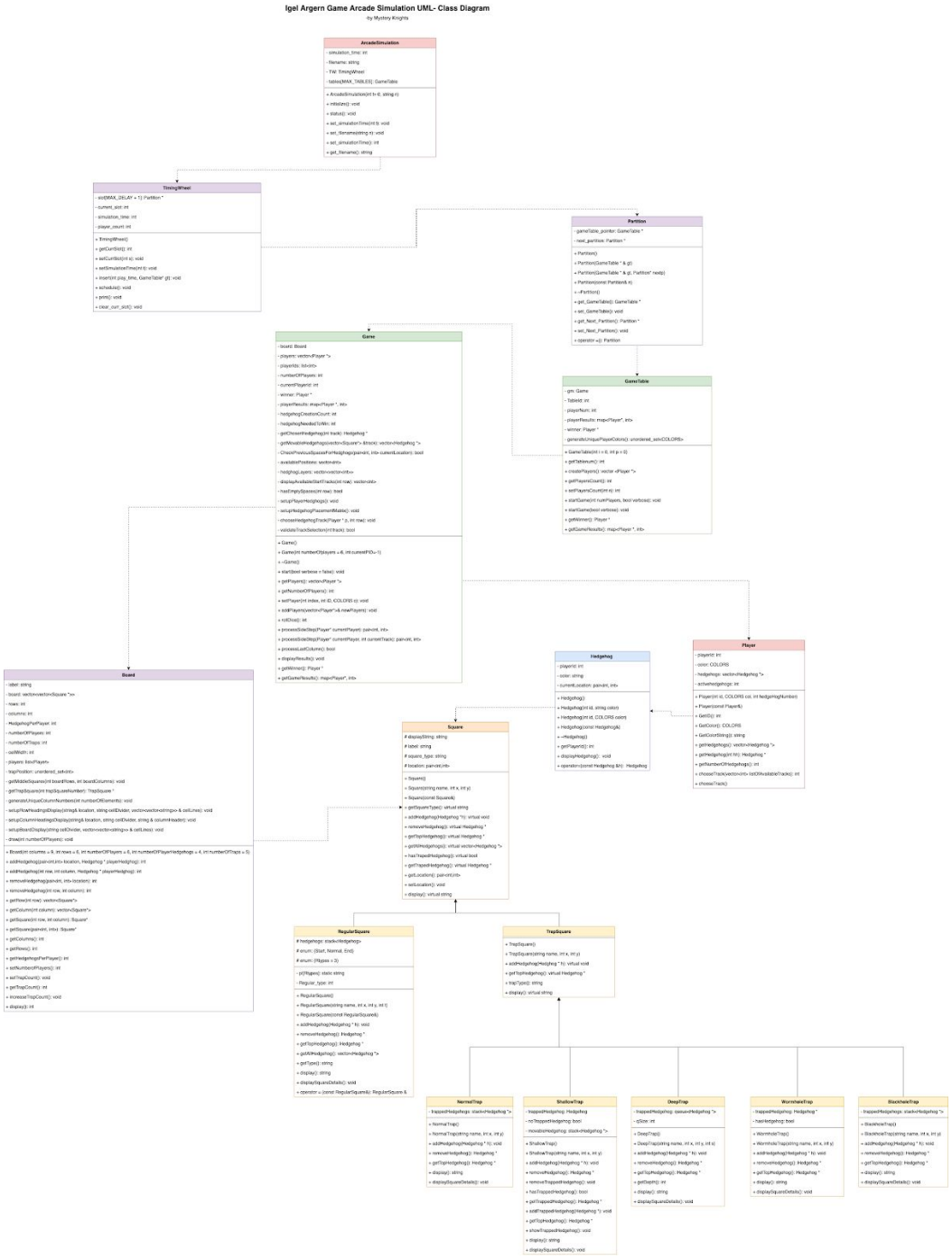
- Choose to step through each round or let the game run through until completion
- Highlight each move of each player for each round for each choice(roll the dice, sidestep, or make player move)
- We have all 5 traps on the board which are in unique columns and rows and different for every game
- Our wormhole feature can zap the hedgehog to any location on the board
- Structured game board for display
- Output the winning results for the individual player and provide stats for all the players

Not implemented but available:

- The following are variables that could be use to change the functionality of the game:
- board rows, board columns, number of hedgehogs per player, number of players per game

UML

Structural Diagram: *See image file for higher resolution



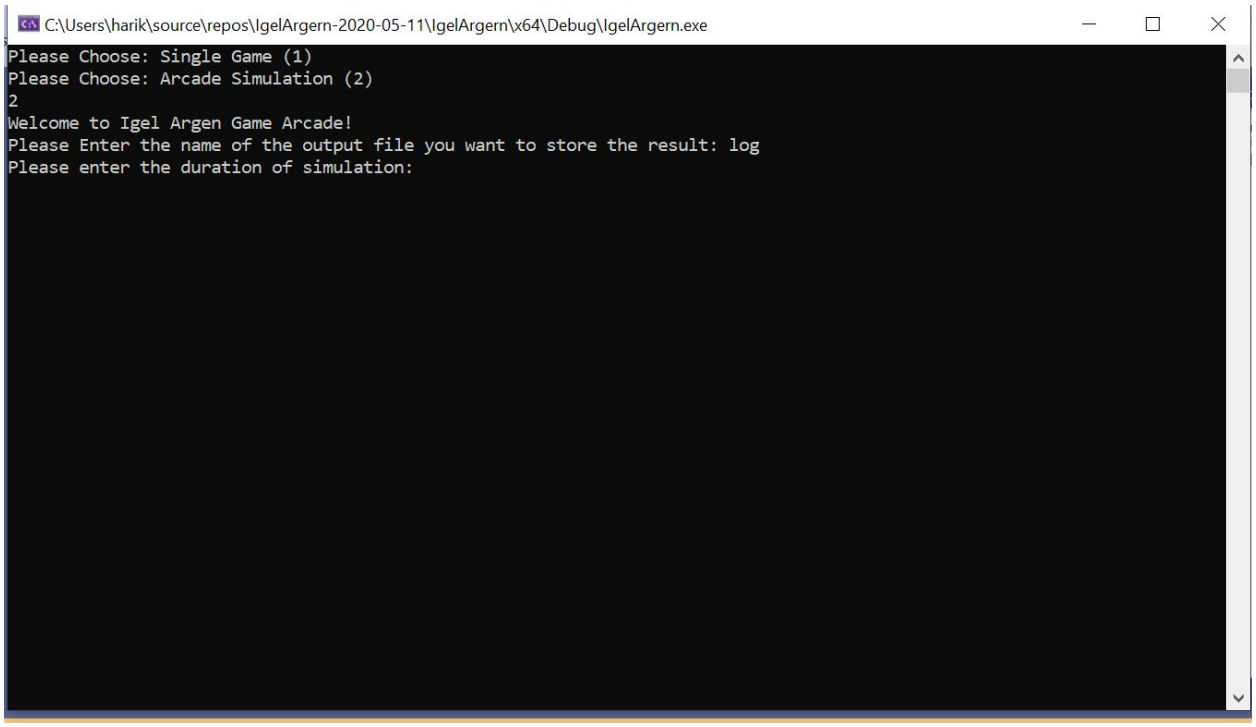
Code:

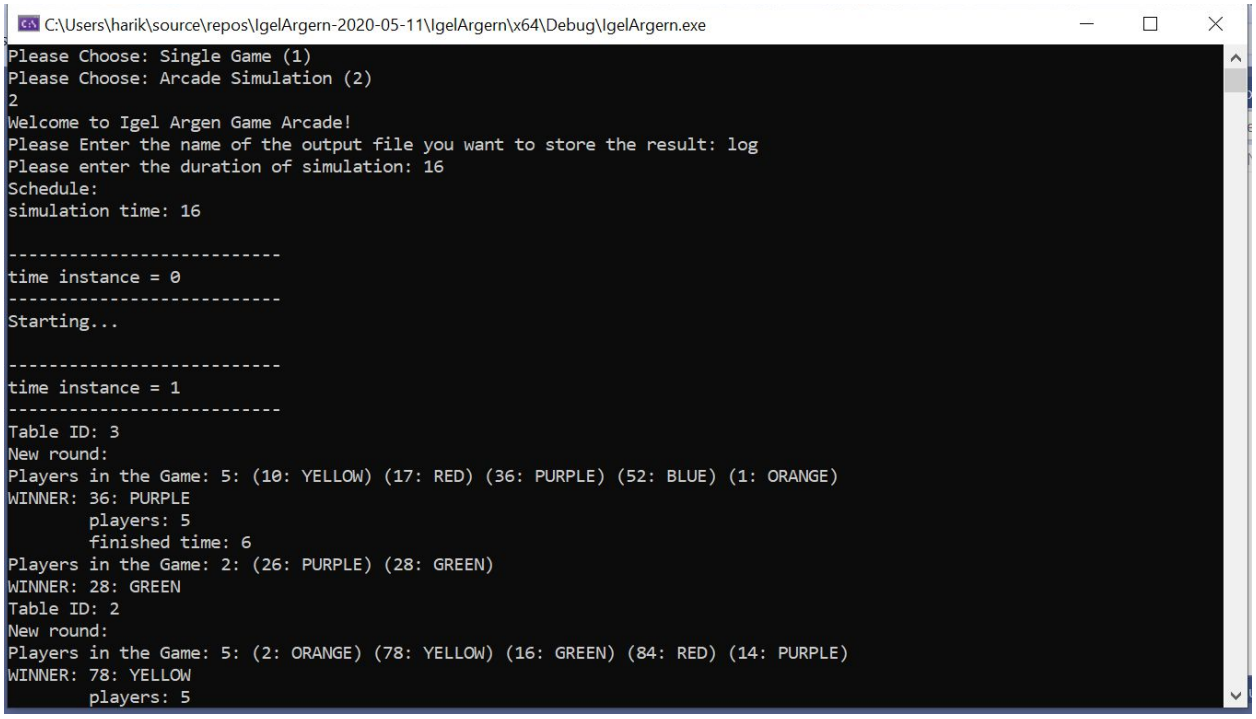
See Following Pages

Results

Arcade Simulation:

Here, we can choose whether we need to start a game or go with the arcade simulation. So by choosing the arcade simulation, we need to enter the simulation time




C:\Users\harik\source\repos\IgelArgern-2020-05-11\IgelArgern\x64\Debug\IgelArgern.exe
Please Choose: Single Game (1)
Please Choose: Arcade Simulation (2)
2
Welcome to Igel Argen Game Arcade!
Please Enter the name of the output file you want to store the result: log
Please enter the duration of simulation: 16
Schedule:
simulation time: 16
---
time instance = 0

Starting...
---
time instance = 1

Table ID: 3
New round:
Players in the Game: 5: (10: YELLOW) (17: RED) (36: PURPLE) (52: BLUE) (1: ORANGE)
WINNER: 36: PURPLE
players: 5
finished time: 6
Players in the Game: 2: (26: PURPLE) (28: GREEN)
WINNER: 28: GREEN
Table ID: 2
New round:
Players in the Game: 5: (2: ORANGE) (78: YELLOW) (16: GREEN) (84: RED) (14: PURPLE)
WINNER: 78: YELLOW
players: 5

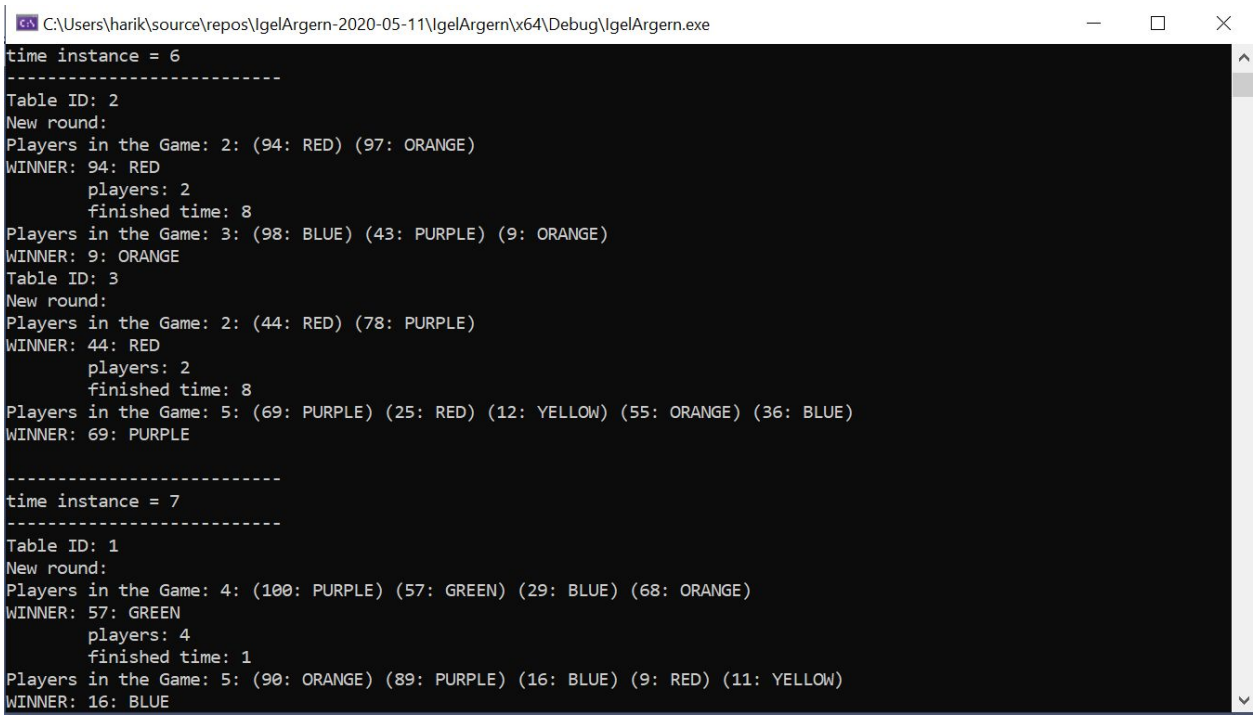
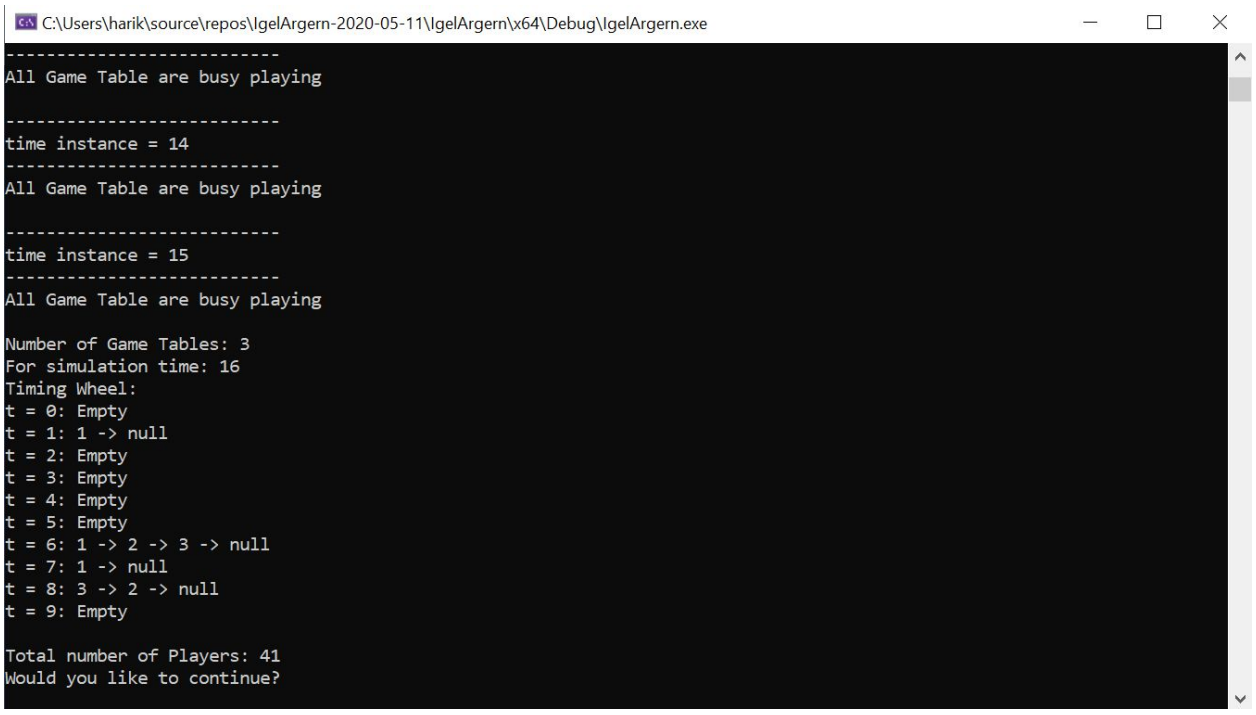
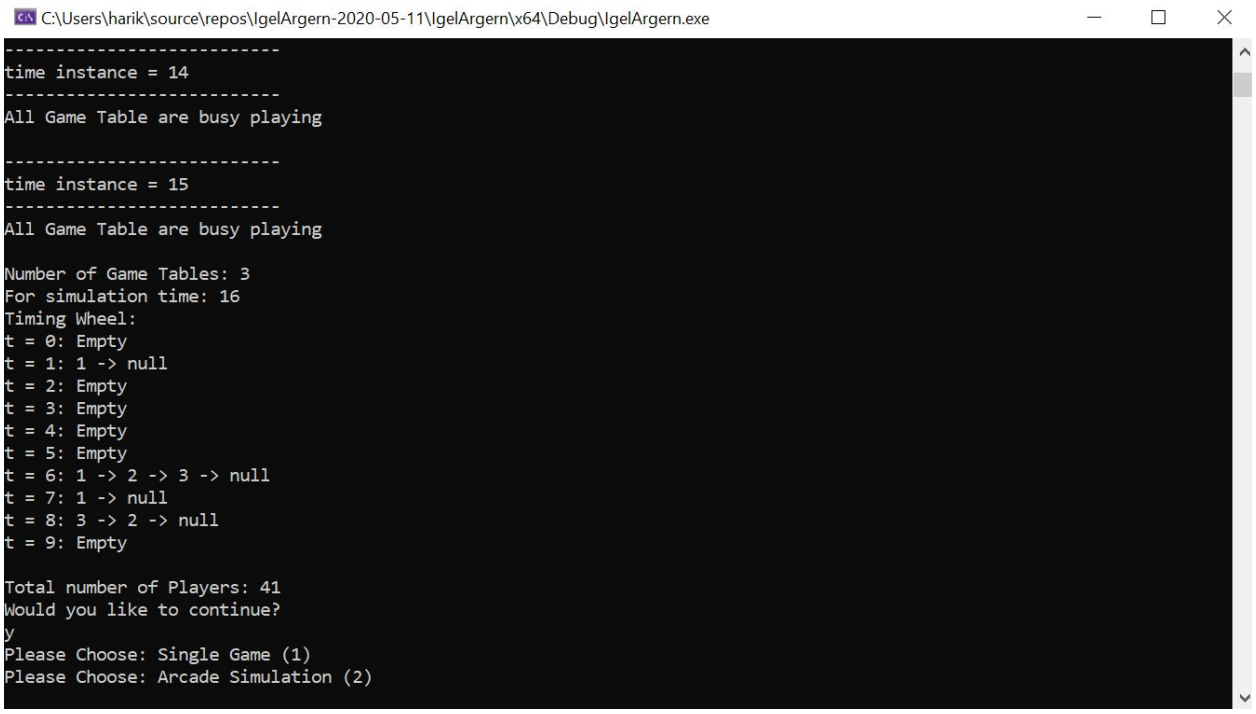

C:\Users\harik\source\repos\IgelArgern-2020-05-11\IgelArgern\x64\Debug\IgelArgern.exe
time instance = 6

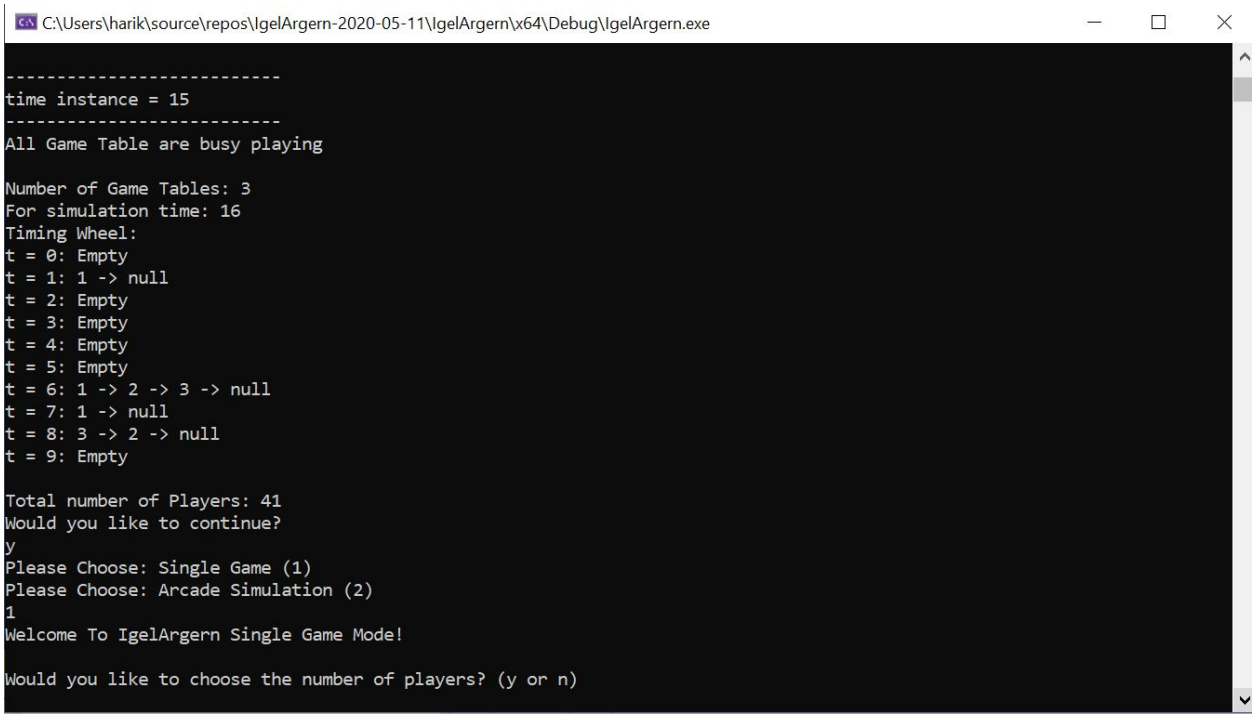
Table ID: 2
New round:
Players in the Game: 2: (94: RED) (97: ORANGE)
WINNER: 94: RED
players: 2
finished time: 8
Players in the Game: 3: (98: BLUE) (43: PURPLE) (9: ORANGE)
WINNER: 9: ORANGE
Table ID: 3
New round:
Players in the Game: 2: (44: RED) (78: PURPLE)
WINNER: 44: RED
players: 2
finished time: 8
Players in the Game: 5: (69: PURPLE) (25: RED) (12: YELLOW) (55: ORANGE) (36: BLUE)
WINNER: 69: PURPLE
---
time instance = 7

Table ID: 1
New round:
Players in the Game: 4: (100: PURPLE) (57: GREEN) (29: BLUE) (68: ORANGE)
WINNER: 57: GREEN
players: 4
finished time: 1
Players in the Game: 5: (90: ORANGE) (89: PURPLE) (16: BLUE) (9: RED) (11: YELLOW)
WINNER: 16: BLUE



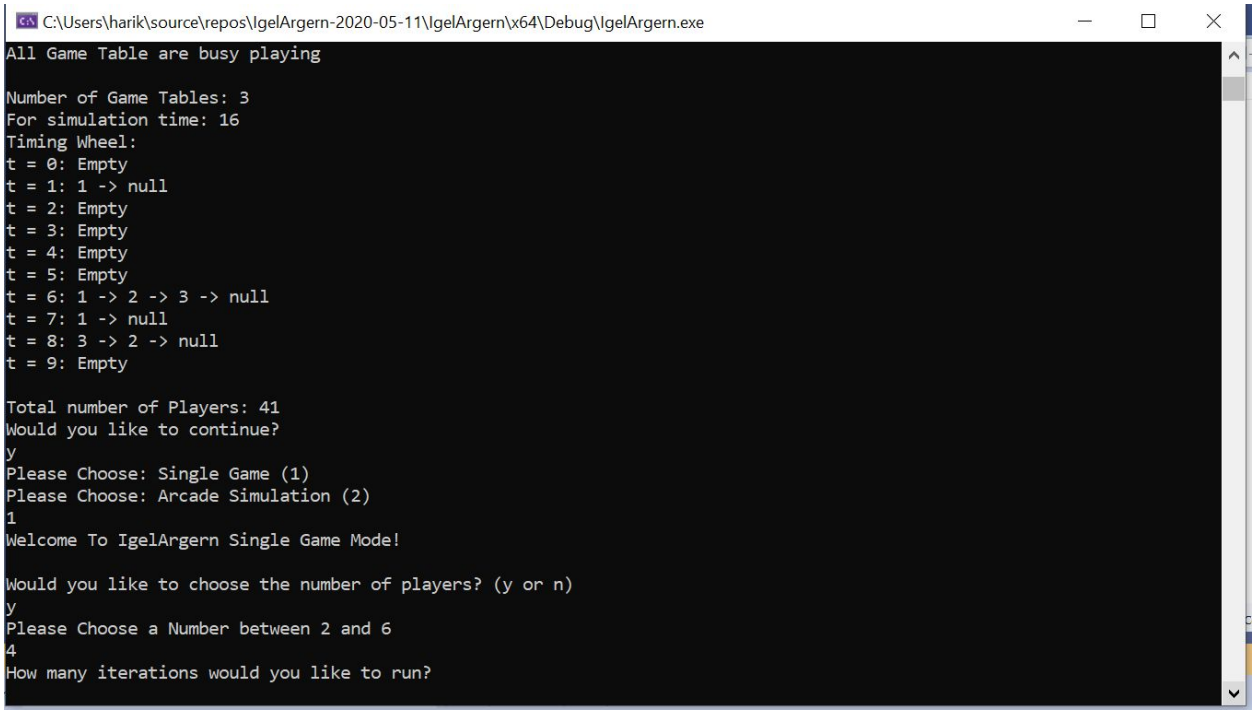
If we would like to continue we can choose either y/n.

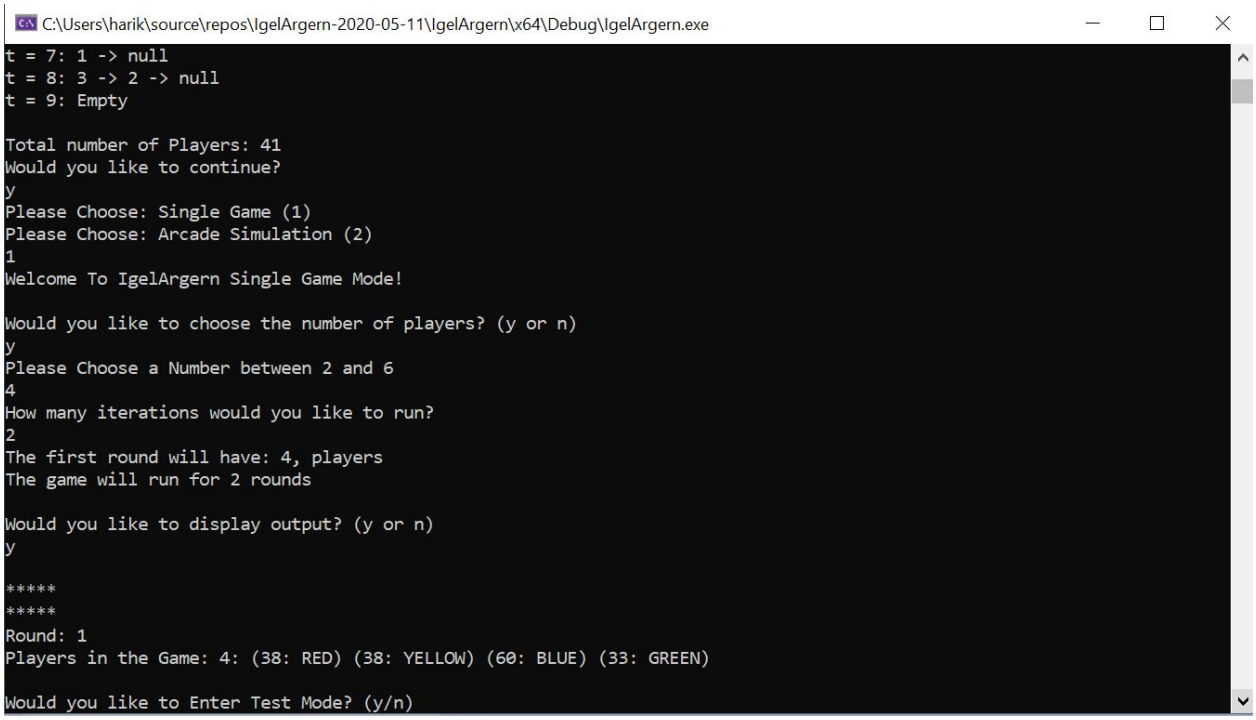




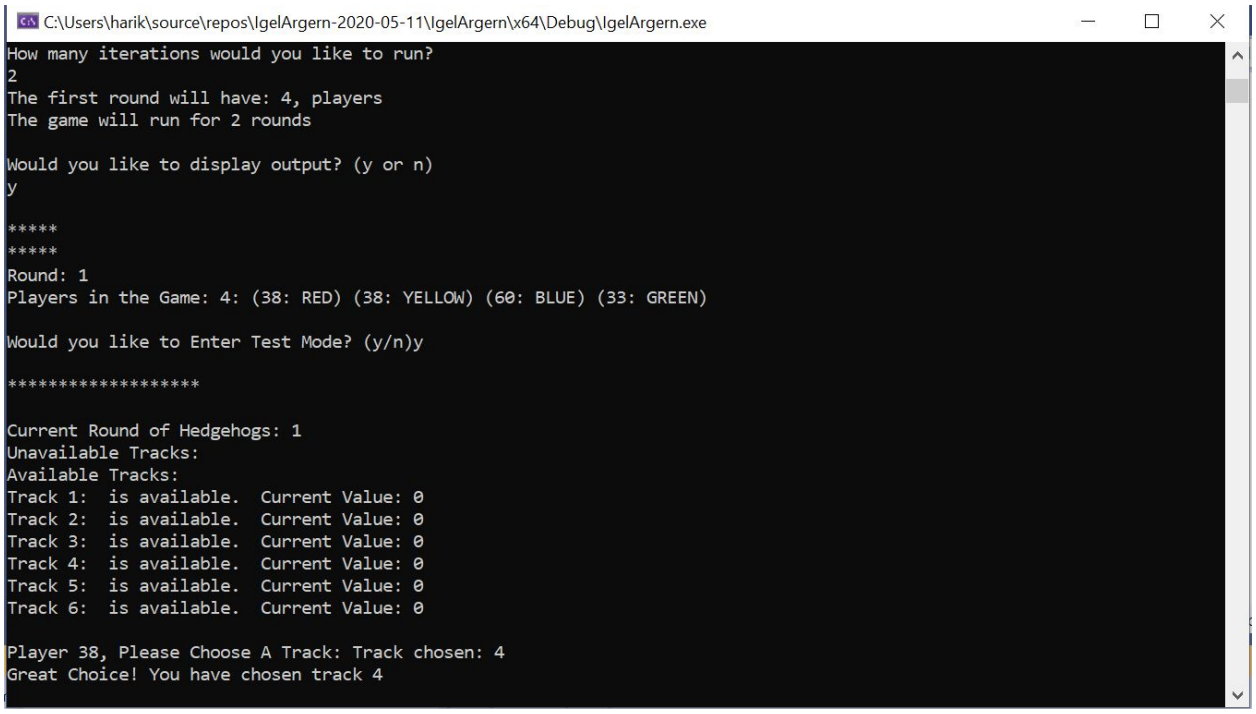
Here we can choose whether we want to select the players or the game itself randomly chooses the players.

Game:

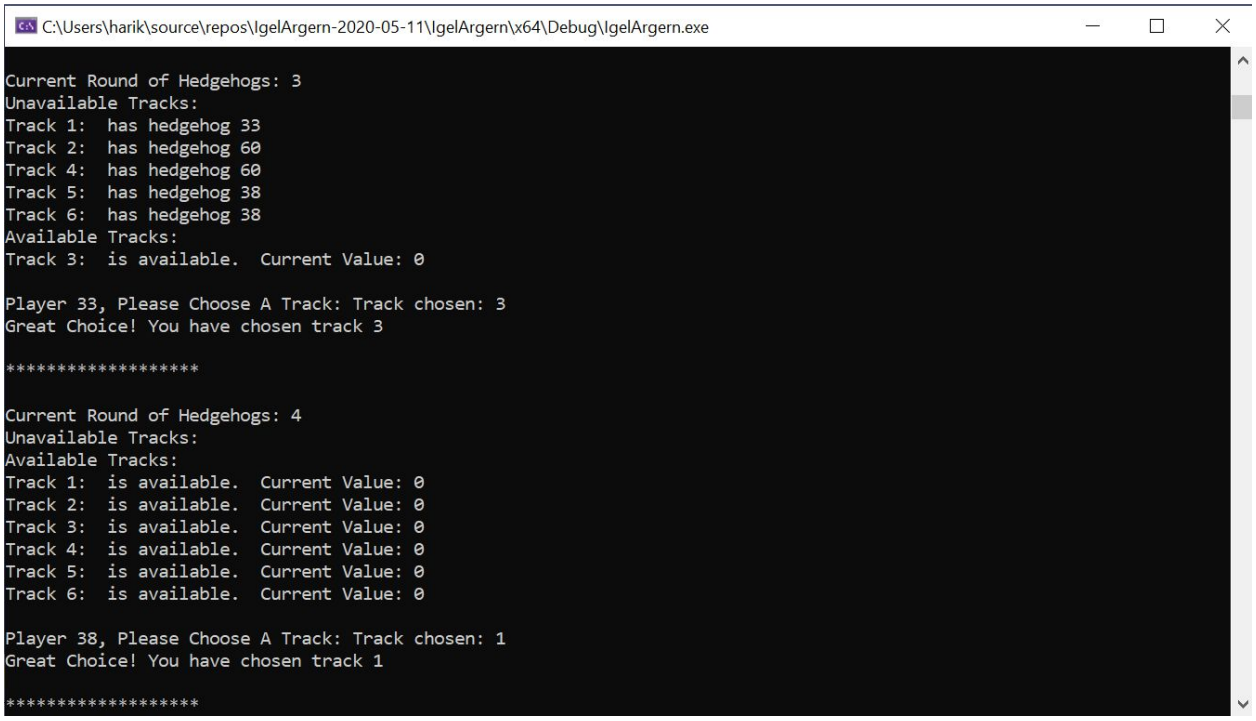




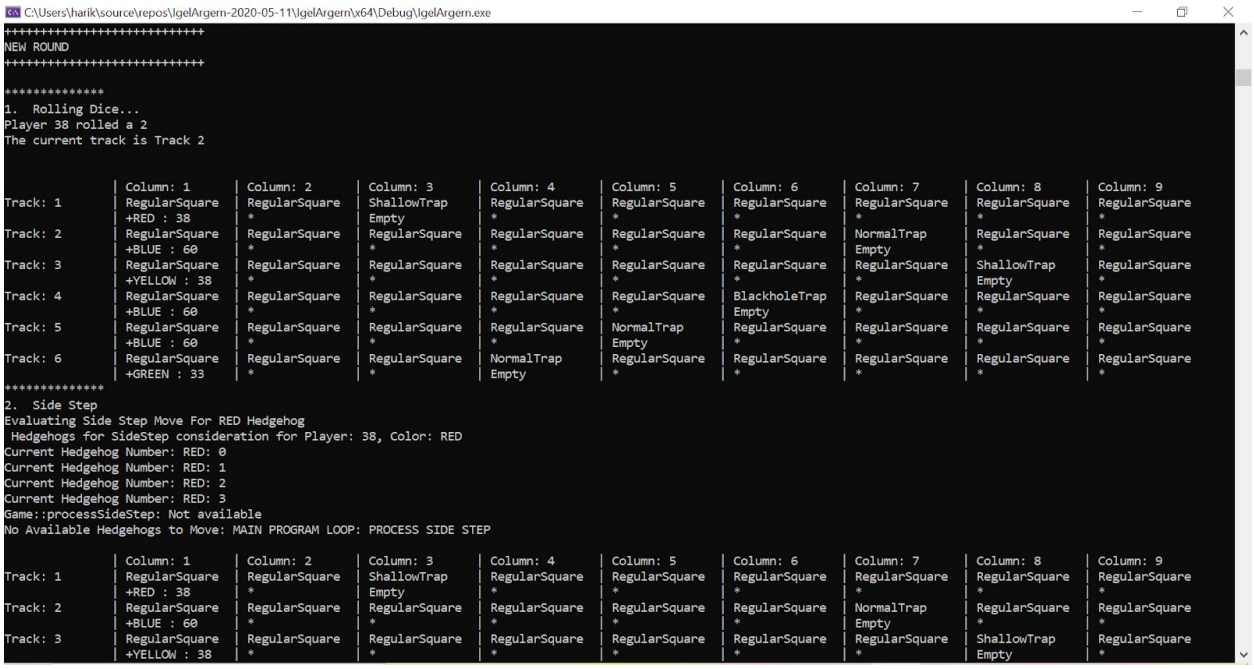
When we don't want the test mode we can enter no ,then it gives you the final winner directly by taking you to the end. If we want to manually check the game process we can go with the yes for the test mode.



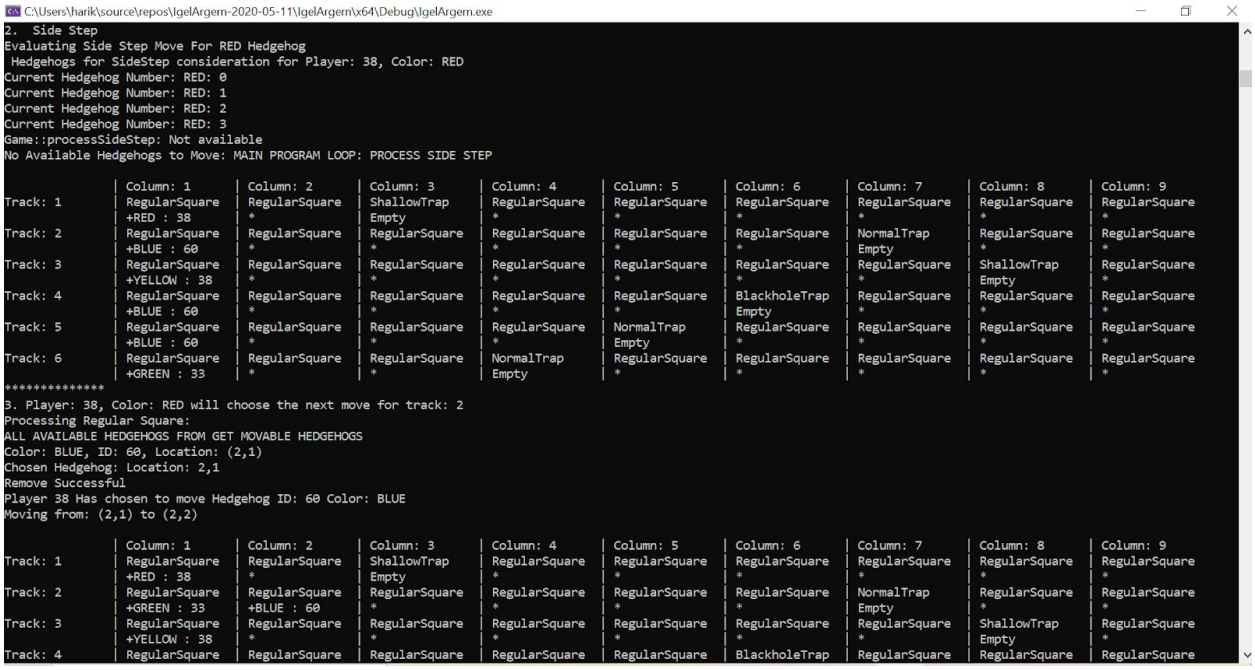
All the hedgehogs of the players will be placed on the board.



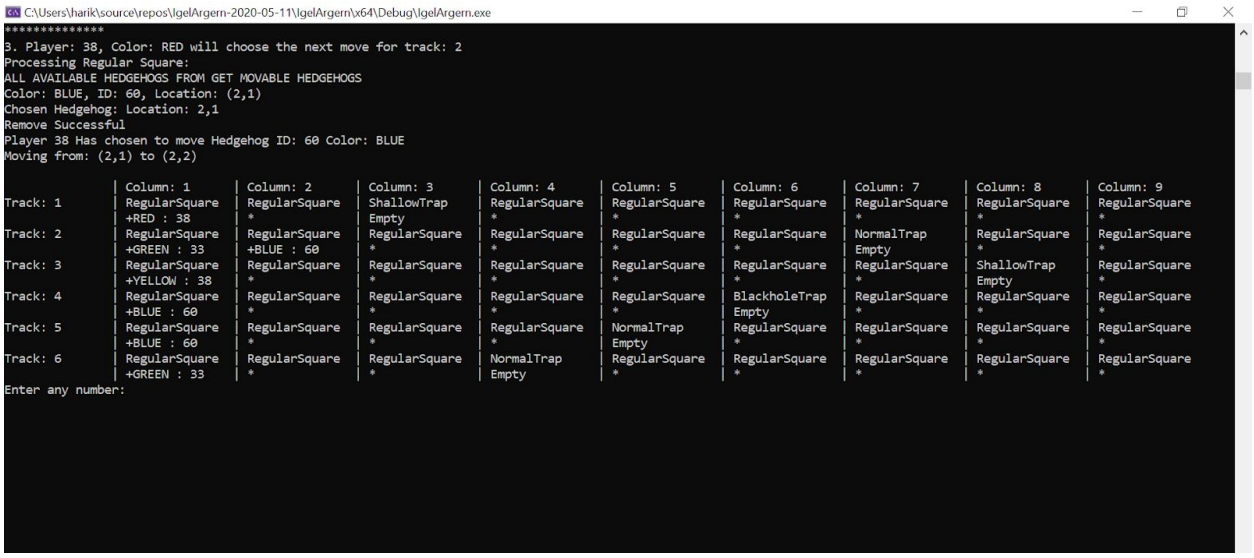
Here , the rounds will be started by having three parts for each round i.e., rolling a die, taking a side step and then moving



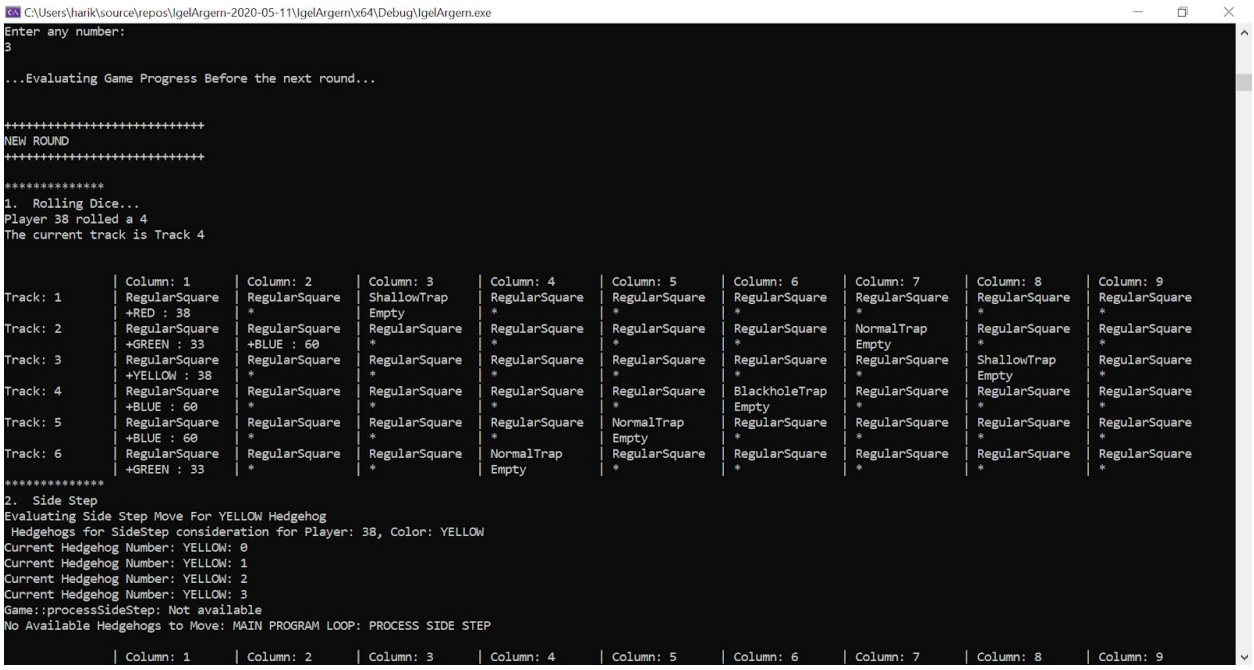
```
C:\Users\harik\source\repos\IgelArgern-2020-05-11\IgelArgern\x64\Debug\IgelArgern.exe
++++++++++++++++++++++++++++
NEW ROUND
++++++++++++++++++++++++++++

**************
1.  Rolling Dice...
Player 38 rolled a 2
The current track is Track 2

              | Column: 1       | Column: 2       | Column: 3       | Column: 4       | Column: 5       | Column: 6       | Column: 7       | Column: 8       | Column: 9
Track: 1      | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +RED : 38       | *               | Empty           | *               | *               | *               | *               | *               | *
Track: 2      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | *               | *               | Empty           | *               | *
Track: 3      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare
              | +YELLOW : 38    | *               | *               | *               | *               | *               | *               | Empty           | *
Track: 4      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | BlackholeTrap   | RegularSquare   | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | *               | Empty           | *               | *               | *
Track: 5      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | Empty           | *               | *               | *               | *
Track: 6      | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +GREEN : 33     | *               | *               | Empty           | *               | *               | *               | *               | *
**************
2.  Side Step
Evaluating Side Step Move For RED Hedgehog
 Hedgehogs for SideStep consideration for Player: 38, Color: RED
Current Hedgehog Number: RED: 0
Current Hedgehog Number: RED: 1
Current Hedgehog Number: RED: 2
Current Hedgehog Number: RED: 3
Game::processSideStep: Not available
No Available Hedgehogs to Move: MAIN PROGRAM LOOP: PROCESS SIDE STEP

              | Column: 1       | Column: 2       | Column: 3       | Column: 4       | Column: 5       | Column: 6       | Column: 7       | Column: 8       | Column: 9
Track: 1      | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +RED : 38       | *               | Empty           | *               | *               | *               | *               | *               | *
Track: 2      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | *               | *               | Empty           | *               | *
Track: 3      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare
              | +YELLOW : 38    | *               | *               | *               | *               | *               | *               | Empty           | *
```

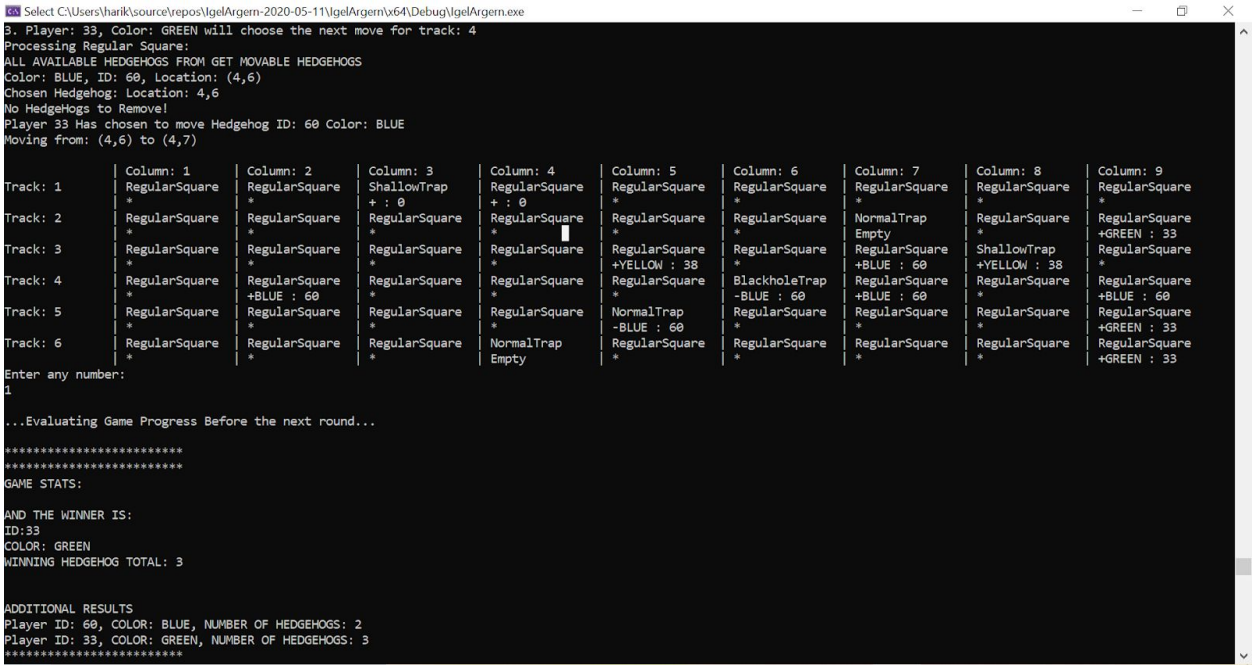


```
C:\Users\harik\source\repos\IgelArgern-2020-05-11\IgelArgern\x64\Debug\IgelArgern.exe
2.  Side Step
Evaluating Side Step Move For RED Hedgehog
 Hedgehogs for SideStep consideration for Player: 38, Color: RED
Current Hedgehog Number: RED: 0
Current Hedgehog Number: RED: 1
Current Hedgehog Number: RED: 2
Current Hedgehog Number: RED: 3
Game::processSideStep: Not available
No Available Hedgehogs to Move: MAIN PROGRAM LOOP: PROCESS SIDE STEP

              | Column: 1       | Column: 2       | Column: 3       | Column: 4       | Column: 5       | Column: 6       | Column: 7       | Column: 8       | Column: 9
Track: 1      | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +RED : 38       | *               | Empty           | *               | *               | *               | *               | *               | *
Track: 2      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | *               | *               | Empty           | *               | *
Track: 3      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare
              | +YELLOW : 38    | *               | *               | *               | *               | *               | *               | Empty           | *
Track: 4      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | BlackholeTrap   | RegularSquare   | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | *               | Empty           | *               | *               | *
Track: 5      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +BLUE : 60      | *               | *               | *               | Empty           | *               | *               | *               | *
Track: 6      | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +GREEN : 33     | *               | *               | Empty           | *               | *               | *               | *               | *
**************
3. Player: 38, Color: RED will choose the next move for track: 2
Processing Regular Square:
ALL AVAILABLE HEDGEHOGS FROM GET MOVABLE HEDGEHOGS
Color: BLUE, ID: 60, Location: (2,1)
Chosen Hedgehog: Location: 2,1
Remove Successful
Player 38 Has chosen to move Hedgehog ID: 60 Color: BLUE
Moving from: (2,1) to (2,2)

              | Column: 1       | Column: 2       | Column: 3       | Column: 4       | Column: 5       | Column: 6       | Column: 7       | Column: 8       | Column: 9
Track: 1      | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare
              | +RED : 38       | *               | Empty           | *               | *               | *               | *               | *               | *
Track: 2      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | NormalTrap      | RegularSquare   | RegularSquare
              | +GREEN : 33     | +BLUE : 60      | *               | *               | *               | *               | Empty           | *               | *
Track: 3      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | ShallowTrap     | RegularSquare
              | +YELLOW : 38    | *               | *               | *               | *               | *               | *               | Empty           | *
Track: 4      | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | RegularSquare   | BlackholeTrap   | RegularSquare   | RegularSquare   | RegularSquare
```

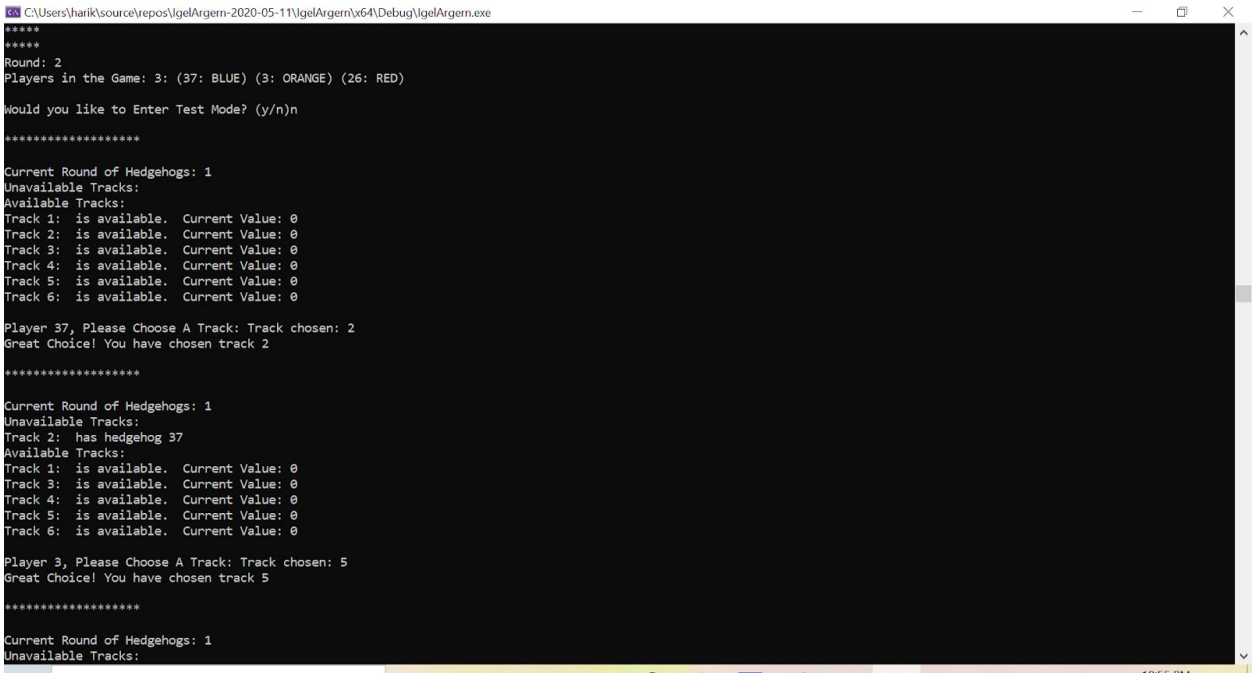


Here this is the manual procedure of testing the game step by step as we enter the number

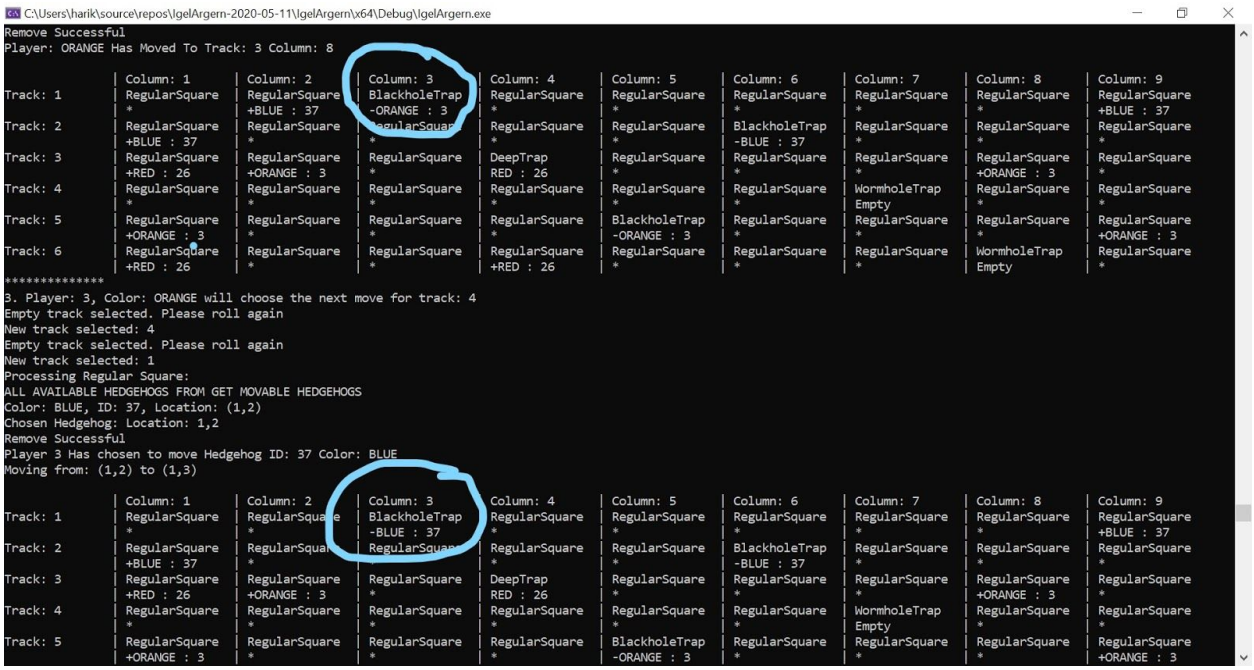


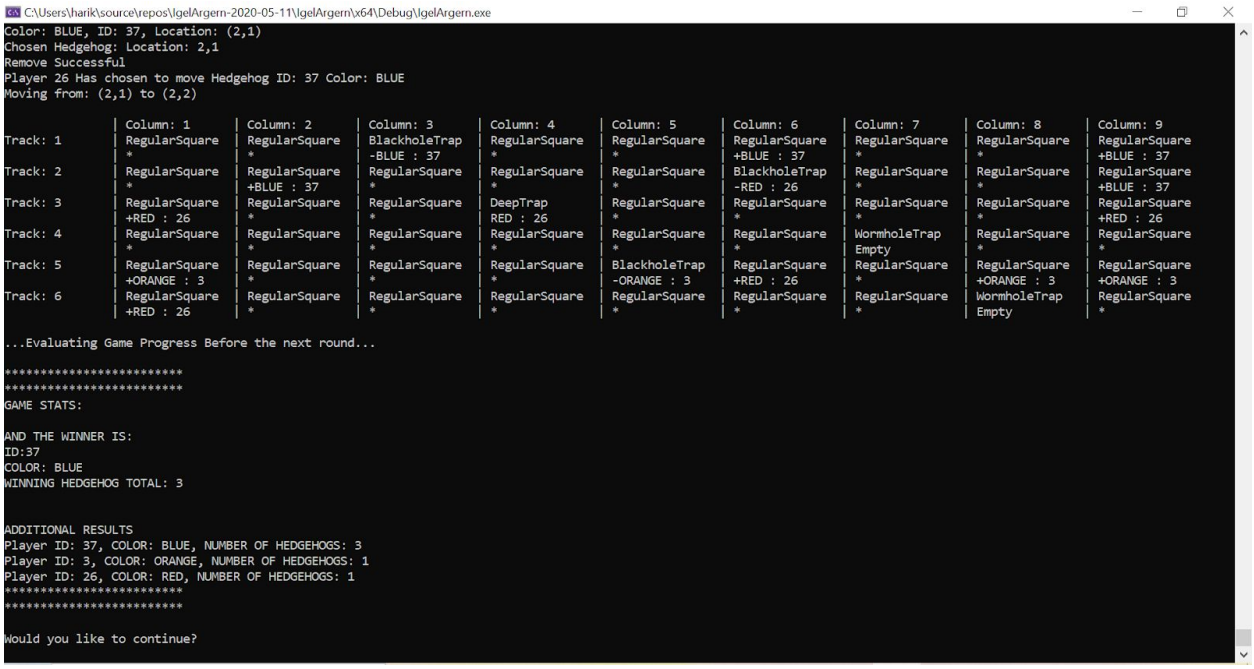


As we move on by entering any of the numbers ,the player who places at least three hedgehogs on the last column will win the game. And at the end it displays the winner and the additional results of other players' hedgehogs on the last column.



If we want to see chose no for the test mode, then




C:\Users\harik\source\repos\IgelArgern-2020-05-11\IgelArgern\x64\Debug\IgelArgern.exe
Color: BLUE, ID: 37, Location: (2,1)
Chosen Hedgehog: Location: 2,1
Remove Successful
Player 26 Has chosen to move Hedgehog ID: 37 Color: BLUE
Moving from: (2,1) to (2,2)
| | Column: 1 | Column: 2 | Column: 3 | Column: 4 | Column: 5 | Column: 6 | Column: 7 | Column: 8 | Column: 9
Track: 1 | RegularSquare | RegularSquare | BlackholeTrap | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare
| * | * | -BLUE : 37 | * | * | +BLUE : 37 | * | * | +BLUE : 37
Track: 2 | RegularSquare | RegularSquare | RegularSquare | RegularSquare | BlackholeTrap | RegularSquare | RegularSquare | RegularSquare | RegularSquare
| * | +BLUE : 37 | * | * | * | -RED : 26 | * | * | +BLUE : 37
Track: 3 | RegularSquare | RegularSquare | RegularSquare | DeepTrap | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare
| +RED : 26 | * | * | RED : 26 | * | * | * | * | +RED : 26
Track: 4 | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare | WormholeTrap | RegularSquare | RegularSquare
| * | * | * | * | * | * | Empty | * | *
Track: 5 | RegularSquare | RegularSquare | RegularSquare | RegularSquare | BlackholeTrap | RegularSquare | RegularSquare | RegularSquare | RegularSquare
| +ORANGE : 3 | * | * | * | -ORANGE : 3 | +RED : 26 | * | +ORANGE : 3 | +ORANGE : 3
Track: 6 | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare | RegularSquare | WormholeTrap | RegularSquare
| +RED : 26 | * | * | * | * | * | * | Empty | *
...Evaluating Game Progress Before the next round...
****
****
GAME STATS:
AND THE WINNER IS:
ID:37
COLOR: BLUE
WINNING HEDGEHOG TOTAL: 3
ADDITIONAL RESULTS
Player ID: 37, COLOR: BLUE, NUMBER OF HEDGEHOGS: 3
Player ID: 3, COLOR: ORANGE, NUMBER OF HEDGEHOGS: 1
Player ID: 26, COLOR: RED, NUMBER OF HEDGEHOGS: 1
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Would you like to continue?