

# SnakeGame

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# Chapter 1

## Class Index

### 1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

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	Stores game parameters such as board dimensions and speed . . . . .	5
<a href="#">Node</a>		
	Represents a single segment of the snake's body . . . . .	6
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	Doubly linked list for managing snake segments. Implements the Rule of Five and custom sorting/searching . . . . .	8



# Chapter 2

## File Index

### 2.1 File List

Here is a list of all files with brief descriptions:

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# Chapter 3

## Class Documentation

### 3.1 GameConfig Struct Reference

Stores game parameters such as board dimensions and speed.

```
#include <GameConfig.h>
```

#### Public Attributes

- int `width`  
*Width of the game board.*
- int `height`  
*Height of the game board.*
- int `speed`  
*Delay between frames in milliseconds.*
- `Difficulty diff`  
*Game difficulty level.*

#### 3.1.1 Detailed Description

Stores game parameters such as board dimensions and speed.

Definition at line 15 of file [GameConfig.h](#).

#### 3.1.2 Member Data Documentation

##### 3.1.2.1 `diff`

`Difficulty GameConfig::diff`

Game difficulty level.

Definition at line 19 of file [GameConfig.h](#).

### 3.1.2.2 height

```
int GameConfig::height
```

Height of the game board.

Definition at line 17 of file [GameConfig.h](#).

### 3.1.2.3 speed

```
int GameConfig::speed
```

Delay between frames in milliseconds.

Definition at line 18 of file [GameConfig.h](#).

### 3.1.2.4 width

```
int GameConfig::width
```

Width of the game board.

Definition at line 16 of file [GameConfig.h](#).

The documentation for this struct was generated from the following file:

- [GameConfig.h](#)

## 3.2 Node Struct Reference

Represents a single segment of the snake's body.

```
#include <SnakeList.h>
```

### Public Member Functions

- [Node \(int \\_x, int \\_y\)](#)

### Public Attributes

- [int x](#)
- [int y](#)

*Coordinates of the segment.*

- [std::unique\\_ptr< Node > next](#)

*Smart pointer to the next segment (forward ownership).*

- [Node \\* prev](#)

*Raw pointer to the previous segment (bidirectional link).*

### 3.2.1 Detailed Description

Represents a single segment of the snake's body.

Definition at line 15 of file [SnakeList.h](#).

### 3.2.2 Constructor & Destructor Documentation

#### 3.2.2.1 Node()

```
Node::Node (
    int _x,
    int _y)
```

Definition at line 9 of file [SnakeList.cpp](#).

### 3.2.3 Member Data Documentation

#### 3.2.3.1 next

```
std::unique_ptr<Node> Node::next
```

Smart pointer to the next segment (forward ownership).

Definition at line 17 of file [SnakeList.h](#).

#### 3.2.3.2 prev

```
Node* Node::prev
```

Raw pointer to the previous segment (bidirectional link).

Definition at line 18 of file [SnakeList.h](#).

#### 3.2.3.3 x

```
int Node::x
```

Definition at line 16 of file [SnakeList.h](#).

#### 3.2.3.4 y

```
int Node::y
```

Coordinates of the segment.

Definition at line 16 of file [SnakeList.h](#).

The documentation for this struct was generated from the following files:

- [SnakeList.h](#)
- [SnakeList.cpp](#)

### 3.3 SnakeList Class Reference

Doubly linked list for managing snake segments. Implements the Rule of Five and custom sorting/searching.

```
#include <SnakeList.h>
```

#### Public Member Functions

- `SnakeList ()`
- `void push_front (int x, int y)`  
*Adds a new segment to the front of the snake.*
- `void pop_back ()`  
*Removes the last segment (tail) of the snake.*
- `bool isSnakeAt (int x, int y) const`  
*Checks if a snake segment exists at given coordinates.*
- `SnakeList (const SnakeList &other)`
- `SnakeList (SnakeList &&other) noexcept`
- `SnakeList & operator= (const SnakeList &other)`
- `SnakeList & operator= (SnakeList &&other) noexcept`
- `void sortContent ()`  
*Sorts segments by X coordinate using Bubble Sort.*

#### 3.3.1 Detailed Description

Doubly linked list for managing snake segments. Implements the Rule of Five and custom sorting/searching.

Definition at line 28 of file [SnakeList.h](#).

#### 3.3.2 Constructor & Destructor Documentation

##### 3.3.2.1 SnakeList() [1/3]

```
SnakeList::SnakeList ()
```

Definition at line 11 of file [SnakeList.cpp](#).

##### 3.3.2.2 SnakeList() [2/3]

```
SnakeList::SnakeList (
    const SnakeList & other)
```

Definition at line 54 of file [SnakeList.cpp](#).

##### 3.3.2.3 SnakeList() [3/3]

```
SnakeList::SnakeList (
    SnakeList && other) [noexcept]
```

Definition at line 64 of file [SnakeList.cpp](#).

### 3.3.3 Member Function Documentation

#### 3.3.3.1 `isSnakeAt()`

```
bool SnakeList::isSnakeAt (
    int x,
    int y) const
```

Checks if a snake segment exists at given coordinates.

##### Returns

true if collision detected.

Definition at line [42](#) of file [SnakeList.cpp](#).

#### 3.3.3.2 `operator=() [1/2]`

```
SnakeList & SnakeList::operator= (
    const SnakeList & other)
```

Definition at line [69](#) of file [SnakeList.cpp](#).

#### 3.3.3.3 `operator=() [2/2]`

```
SnakeList & SnakeList::operator= (
    SnakeList && other) [noexcept]
```

Definition at line [87](#) of file [SnakeList.cpp](#).

#### 3.3.3.4 `pop_back()`

```
void SnakeList::pop_back ()
```

Removes the last segment (tail) of the snake.

Definition at line [27](#) of file [SnakeList.cpp](#).

### 3.3.3.5 push\_front()

```
void SnakeList::push_front (
    int x,
    int y)
```

Adds a new segment to the front of the snake.

#### Parameters

x	X coordinate.
y	Y coordinate.

Definition at line 12 of file [SnakeList.cpp](#).

### 3.3.3.6 sortContent()

```
void SnakeList::sortContent ()
```

Sorts segments by X coordinate using Bubble Sort.

Definition at line 97 of file [SnakeList.cpp](#).

The documentation for this class was generated from the following files:

- [SnakeList.h](#)
- [SnakeList.cpp](#)

# Chapter 4

## File Documentation

### 4.1 Draw.cpp File Reference

Implementation of the rendering engine.

```
#include "Draw.h"
```

#### Functions

- void [Draw](#) (const [GameConfig](#) &cfg, [SnakeList](#) &snake, int fruitX, int fruitY, int score)  
*Renders the game board, snake, and fruit.*

#### 4.1.1 Detailed Description

Implementation of the rendering engine.

- Uses Windows console API to position the cursor and draw the game board, snake segments, and fruits without flickering.

Definition in file [Draw.cpp](#).

## 4.1.2 Function Documentation

### 4.1.2.1 Draw()

```
void Draw (
    const GameConfig & cfg,
    SnakeList & snake,
    int fruitX,
    int fruitY,
    int score)
```

Renders the game board, snake, and fruit.

#### Parameters

<i>cfg</i>	Current game configuration.
<i>snake</i>	Reference to the <a href="#">SnakeList</a> object.
<i>fruitX</i>	X-coordinate of the fruit.
<i>fruitY</i>	Y-coordinate of the fruit.
<i>score</i>	Current player score.

Definition at line 9 of file [Draw.cpp](#).

## 4.2 Draw.cpp

[Go to the documentation of this file.](#)

```
00001
00007 #include "Draw.h"
00008
00009 void Draw(const GameConfig& cfg, SnakeList& snake, int fruitX, int fruitY, int score) {
00010
00011     COORD cursorPosition;
00012     cursorPosition.X = 0;
00013     cursorPosition.Y = 0;
00014
00015     SetConsoleCursorPosition(GetStdHandle(STD_OUTPUT_HANDLE), cursorPosition);
00016     //upper wall
00017     for (int i = 0; i < (cfg.width/2)-8; i++) { std::cout << " "; }
00018     std::cout << "----SNAKE GAME---\n";
00019     for (int i = 0; i < cfg.width + 2; i++) { std::cout << "#"; }
00020     std::cout << "\n";
00021
00022
00023     //left wall->checking if snake is on j,i position-> right wall
00024     for (int i = 0; i < cfg.height; i++) {
00025         for (int j = 0; j < cfg.width; j++) {
00026             if (j == 0) std::cout << "#";
00027             if (snake.isSnakeAt(j, i)) {
00028                 std::cout << "O";
00029             }
00030             else if (j == fruitX && i == fruitY)
00031             {
00032                 std::cout << "Q";
00033             }
00034             else {
00035                 std::cout << " ";
00036             }
00037             if (j == cfg.width - 1) std::cout << "#";
00038         }
00039         std::cout << "\n";
00040     }
00041     //bottom wall
00042     for (int i = 0; i < cfg.width + 2; i++) {
00043         std::cout << "#";
00044     }
```

```

00045     std::cout << "\n";
00046
00047     std::cout << "-----";
00048
00049     std::cout << "\n";
00050     //Final score= Points * speed!
00051     std::cout << "Points: " << score << "| map config: " << cfg.width << "x" << cfg.height << "| speed :" <<
00052     110-cfg.speed << "\n";
00053
00054
00055 }
```

## 4.3 Draw.h File Reference

Functions responsible for rendering the game state to the console.

```
#include "GameConfig.h"
#include "SnakeList.h"
```

### Functions

- void [Draw](#) (const [GameConfig](#) &cfg, [SnakeList](#) &snake, int fruitX, int fruitY, int score)  
*Renders the game board, snake, and fruit.*

### 4.3.1 Detailed Description

Functions responsible for rendering the game state to the console.

Definition in file [Draw.h](#).

### 4.3.2 Function Documentation

#### 4.3.2.1 [Draw\(\)](#)

```
void Draw (
    const GameConfig & cfg,
    SnakeList & snake,
    int fruitX,
    int fruitY,
    int score)
```

Renders the game board, snake, and fruit.

#### Parameters

<i>cfg</i>	Current game configuration.
<i>snake</i>	Reference to the <a href="#">SnakeList</a> object.
<i>fruitX</i>	X-coordinate of the fruit.
<i>fruitY</i>	Y-coordinate of the fruit.

score	Current player score.
-------	-----------------------

Definition at line 9 of file [Draw.cpp](#).

## 4.4 Draw.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #include "GameConfig.h"
00007 #include "SnakeList.h"
00008
00017 void Draw(const GameConfig& cfg, SnakeList& snake, int fruitX, int fruitY, int score);
00018 void Draw(const GameConfig& cfg, SnakeList& snake, int fruitX, int fruitY, int score);
```

## 4.5 GameConfig.cpp File Reference

Implementation of configuration loading.

```
#include "GameConfig.h"
#include <conio.h>
```

### Functions

- [GameConfig loadConfig \(std::string filename\)](#)

*Loads game configuration from a file.*

### 4.5.1 Detailed Description

Implementation of configuration loading.

- Handles reading game parameters from external files and provides fallback default values in case of errors.

Definition in file [GameConfig.cpp](#).

## 4.5.2 Function Documentation

### 4.5.2.1 loadConfig()

```
GameConfig loadConfig (
    std::string filename)
```

Loads game configuration from a file.

#### Parameters

<i>filename</i>	Name of the file containing config data.
-----------------	--

#### Returns

`GameConfig` object with loaded or default values.

Definition at line 9 of file [GameConfig.cpp](#).

## 4.6 GameConfig.cpp

[Go to the documentation of this file.](#)

```
00001
00007 #include "GameConfig.h"
00008 #include <conio.h>
00009 GameConfig loadConfig(std::string filename) {
00010     std::ifstream file(filename);
00011     GameConfig config;
00012     std::string tempDiff;
00013
00014     if (!file.is_open()) {
00015         std::cerr << "Error: cannot open the file: " << filename << "!" << std::endl;
00016         std::cerr << "Loading default settings..." << std::endl;
00017         std::cerr << "Press any key to continue..." << std::endl;
00018         _getch();
00019         system("cls");
00020         return { 20,15,100,Difficulty::EASY };
00021     }
00022
00023     file >> config.width >> config.height >> config.speed >> tempDiff;
00024     if (config.width > 100 || config.height > 24) {
00025         std::cerr << "Error: maximum width is 100 and maximum height is 24 " << std::endl;
00026         std::cerr << "Loading default settings..." << std::endl;
00027         std::cerr << "Press any key to continue..." << std::endl;
00028         _getch();
00029         system("cls");
00030
00031         return { 20,15,100,Difficulty::EASY };
00032     }
00033     if (tempDiff == "HARD") {
00034         config.diff = Difficulty::HARD;
00035     }
00036     else if (tempDiff == "MEDIUM") {
00037         config.diff = Difficulty::MEDIUM;
00038     }
00039     else {
00040         config.diff = Difficulty::EASY;
00041     }
00042     file.close();
00043     return config;
00044
00045
00046 }
```

## 4.7 GameConfig.h File Reference

Configuration structures and functions for game settings.

```
#include <iostream>
#include <windows.h>
#include <fstream>
#include "Types.h"
```

### Classes

- struct [GameConfig](#)  
*Stores game parameters such as board dimensions and speed.*

### Functions

- [GameConfig loadConfig \(std::string filename\)](#)  
*Loads game configuration from a file.*

### 4.7.1 Detailed Description

Configuration structures and functions for game settings.

Definition in file [GameConfig.h](#).

### 4.7.2 Function Documentation

#### 4.7.2.1 [loadConfig\(\)](#)

```
GameConfig loadConfig (
    std::string filename)
```

Loads game configuration from a file.

##### Parameters

<i>filename</i>	Name of the file containing config data.
-----------------	--

##### Returns

[GameConfig](#) object with loaded or default values.

Definition at line 9 of file [GameConfig.cpp](#).

## 4.8 GameConfig.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #include <iostream>
00007 #include <windows.h>
00008 #include <fstream>
00009 #include "Types.h"
00010
00015 struct GameConfig {
00016     int width;
00017     int height;
00018     int speed;
00019     Difficulty diff;
00020 };
00021
00027 GameConfig loadConfig(std::string filename);
```

## 4.9 main.cpp File Reference

The main entry point for the Snake game.

```
#include "SnakeList.h"
#include "GameConfig.h"
#include "Draw.h"
#include "Types.h"
#include "SaveHighScore.h"
```

### Functions

- [int main \(\)](#)

#### 4.9.1 Detailed Description

The main entry point for the Snake game.

- Coordinates the game loop, input handling, movement logic, collision detection, and difficulty scaling.

Definition in file [main.cpp](#).

#### 4.9.2 Function Documentation

##### 4.9.2.1 main()

```
int main ()
```

Definition at line 14 of file [main.cpp](#).

## 4.10 main.cpp

[Go to the documentation of this file.](#)

```
00001
00007 #include "SnakeList.h"
00008 #include "GameConfig.h"
00009 #include "Draw.h"
00010 #include "Types.h"
00011 #include "SaveHighScore.h"
00012
00013
00014 int main() {
00015     GameConfig cfg = loadConfig("config.txt");
00016     eDirection dir = eDirection::STOP;
00017     SnakeList snake;
00018
00019     int score = 0;
00020     int headX = cfg.width / 2;
00021     int headY = cfg.height / 2;
00022     int fruitX = rand() % cfg.width;
00023     int fruitY = rand() % cfg.height;
00024     bool gameOver = false;
00025     snake.push_front(headX, headY);
00026
00027     while (!gameOver) {
00028
00029         if (_kbhit()) {
00030             switch (_getch())
00031             {
00032                 case 'a':
00033                     if(dir!=eDirection::RIGHT) dir = eDirection::LEFT;
00034                     break;
00035                 case 'd':
00036                     if(dir!=eDirection::LEFT) dir = eDirection::RIGHT;
00037                     break;
00038                 case 'w':
00039                     if(dir!=eDirection::DOWN) dir = eDirection::UP;
00040                     break;
00041                 case 's':
00042                     if (dir != eDirection::UP) dir = eDirection::DOWN;
00043                     break;
00044                 case 'x':
00045                     gameOver = true;
00046                     break;
00047             }
00048         }
00049
00050
00051         if (dir != eDirection::STOP) {
00052             if (dir == eDirection::LEFT) {
00053                 headX--;
00054             }
00055             else if (dir == eDirection::RIGHT) {
00056                 headX++;
00057             }
00058             else if (dir == eDirection::UP) {
00059                 headY--;
00060             }
00061             else if (dir == eDirection::DOWN) {
00062                 headY++;
00063             }
00064             if (snake.isSnakeAt(headX, headY)) {
00065                 gameOver = true;
00066             }
00067             snake.push_front(headX, headY);
00068
00069
00070             if (headX == fruitX && headY == fruitY) {
00071
00072
00073
00074                 switch (cfg.diff) {
00075                     case Difficulty::EASY:
00076                         score += 10;
00077                         fruitX = rand() % cfg.width;
00078                         fruitY = rand() % cfg.height;
00079                         break;
00080                     case Difficulty::MEDIUM:
00081                         score += 20;
00082                         cfg.speed -= 2;
00083                         fruitX = rand() % cfg.width;
00084                         fruitY = rand() % cfg.height;
00085                         break;
00086
00087                     case Difficulty::HARD:
```

```

00088         system("cls");
00089         score += 50;
00090         cfg.speed -= 3;
00091         if (cfg.width > 10) cfg.width -= 1;
00092         if (cfg.height > 5) cfg.height -= 1;
00093         fruitX = 1 + (rand() % (cfg.width - 2));
00094         fruitY = 1 + (rand() % (cfg.height - 2));
00095         break;
00096     }
00097     MessageBeep(MB_ICONWARNING);
00098
00099
00100 }
00101 else {
00102     snake.pop_back();
00103 }
00104
00105 }
00106 Draw(cfg, snake, fruitX, fruitY, score);
00107 if (headX < 0 || headX >= cfg.width || headY < 0 || headY >= cfg.height) {
00108     gameOver = true;
00109 }
00110
00111 }
00112 Sleep(cfg.speed);
00113
00114
00115 }
00116 int finalScore = score * (110 - cfg.speed);
00117 std::cout << "=====";
00118 std::cout << " GAME OVER! ";
00119 std::cout << "=====";
00120 std::cout << " Your Final Score: " << finalScore << std::endl;
00121 std::cout << "=====";
00122 std::string name;
00123 std::cout << "Enter your name: ";
00124 std::cin >> name;
00125 saveHighScore(name, finalScore);
00126 displayLeaderboard();
00127 std::cout << "\nPress any key to exit...";
00128 _getch();
00129 return 0;
00130 }
```

## 4.11 SaveHighScore.cpp File Reference

Implementation of the high score system.

```
#include "SaveHighScore.h"
#include <iostream>
```

### Functions

- void **saveHighScore** (std::string playerName, int score)
   
*Appends a new score to the highscore file.*
- void **displayLeaderboard** ()
   
*Displays the leaderboard from the highscore file to the console.*

### 4.11.1 Detailed Description

Implementation of the high score system.

- Manages permanent storage of player results in a text file and handles leaderboard display.

Definition in file [SaveHighScore.cpp](#).

## 4.11.2 Function Documentation

### 4.11.2.1 displayLeaderboard()

```
void displayLeaderboard ()
```

Displays the leaderboard from the highscore file to the console.

Definition at line 22 of file [SaveHighScore.cpp](#).

### 4.11.2.2 saveHighScore()

```
void saveHighScore (
    std::string playerName,
    int score)
```

Appends a new score to the highscore file.

#### Parameters

<i>playerName</i>	Name of the player.
<i>score</i>	Final score achieved.

Definition at line 10 of file [SaveHighScore.cpp](#).

## 4.12 SaveHighScore.cpp

[Go to the documentation of this file.](#)

```
00001
00007 #pragma once
00008 #include "SaveHighScore.h"
00009 #include <iostream>
00010 void saveHighScore(std::string playerName, int score) {
00011     std::ofstream outFile("highscores.txt", std::ios::app);
00012     if (outFile.is_open()) {
00013         outFile << playerName << " | Score: " << score << std::endl;
00014         outFile.close();
00015     }
00016     else {
00017         std::cerr << "Error: Could not open highscores.txt for writing!";
00018     }
00019 }
00020
00021
00022 void displayLeaderboard(){
00023     std::ifstream inFile("highscores.txt");
00024     std::string line;
00025     system("cls");
00026     std::cout << "==== RECENT SCORES ====\n" << std::endl;
00027     if (inFile.is_open()) {
00028         while (getline(inFile, line)) {
00029             std::cout << line << std::endl;
00030         }
00031     }
00032     else {
00033         std::cout << "No scores yet. Be the first!" << std::endl;
00034     }
00035     std::cout << "\n=====\n" << std::endl;
00036
00037 }
```

## 4.13 SaveHighScore.h File Reference

File I/O operations for saving and displaying player scores.

```
#include <fstream>
#include <string>
```

### Functions

- void [saveHighScore](#) (std::string playerName, int score)  
*Appends a new score to the highscore file.*
- void [displayLeaderboard](#) ()  
*Displays the leaderboard from the highscore file to the console.*

### 4.13.1 Detailed Description

File I/O operations for saving and displaying player scores.

Definition in file [SaveHighScore.h](#).

### 4.13.2 Function Documentation

#### 4.13.2.1 [displayLeaderboard\(\)](#)

```
void displayLeaderboard ()
```

Displays the leaderboard from the highscore file to the console.

Definition at line [22](#) of file [SaveHighScore.cpp](#).

#### 4.13.2.2 [saveHighScore\(\)](#)

```
void saveHighScore (
    std::string playerName,
    int score)
```

Appends a new score to the highscore file.

#### Parameters

<i>playerName</i>	Name of the player.
<i>score</i>	Final score achieved.

Definition at line [10](#) of file [SaveHighScore.cpp](#).

## 4.14 SaveHighScore.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #include <fstream>
00007 #include <string>
00013 void saveHighScore(std::string playerName, int score);
00014
00018 void displayLeaderboard();
```

## 4.15 SnakeList.cpp File Reference

Implementation of the [SnakeList](#) class and its memory management.

```
#include "SnakeList.h"
```

### 4.15.1 Detailed Description

Implementation of the [SnakeList](#) class and its memory management.

- Contains the logic for the doubly linked list, including the Rule of Five (copy/move constructors and assignment operators) and the sorting algorithm.

Definition in file [SnakeList.cpp](#).

## 4.16 SnakeList.cpp

[Go to the documentation of this file.](#)

```
00001
00007 #include "SnakeList.h"
00008
00009 Node::Node(int _x, int _y)
00010   : x(_x), y(_y), prev(nullptr), next(nullptr) {};
00011 SnakeList::SnakeList() : head(nullptr), tail(nullptr) {};
00012 void SnakeList::push_front(int x, int y) {
00013   auto newNode = std::make_unique<Node>(x, y);
00014   if (!head) {
00015     head = move(newNode);
00016     tail = head.get();
00017   }
00018   else {
00019     newNode->next = move(head);
00020     newNode->next->prev = newNode.get();
00021     head = move(newNode);
00022   }
00023
00024 }
00025
00026
00027 void SnakeList::pop_back() {
00028   if (!head) {
00029     return;
00030   }
00031   if (head.get() == tail) {
00032     head.reset();
00033     tail = nullptr;
00034   }
00035   else {
00036     Node* newTail = tail->prev;
```

```

00037         newTail->next.reset();
00038         tail = newTail;
00039     }
00040
00041 }
00042 bool SnakeList::isSnakeAt(int x, int y) const{
00043     Node* temp = head.get();
00044     while (temp) {
00045         if (temp->x == x && temp->y == y) {
00046             return true;
00047         }
00048         temp = temp->next.get();
00049     }
00050     return false;
00051 }
00052
00053 //Deep copy
00054 SnakeList::SnakeList(const SnakeList& other) : head(nullptr), tail(nullptr) {
00055     if (!other.tail) return;
00056     Node* temp = other.tail;
00057     while (temp) {
00058         this->push_front(temp->x, temp->y);
00059         temp = temp->prev;
00060     }
00061 }
00062
00063 //Move Constructor
00064 SnakeList::SnakeList(SnakeList&& other) noexcept : head(std::move(other.head)), tail(other.tail) {
00065     other.tail = nullptr;
00066 }
00067
00068 //Copy operator
00069 SnakeList& SnakeList::operator=(const SnakeList& other) {
00070     if (this != &other) {
00071         head.reset();
00072         tail = nullptr;
00073
00074         if (other.tail) {
00075             Node* temp = other.tail;
00076             while (temp) {
00077                 this->push_front(temp->x, temp->y);
00078                 temp = temp->prev;
00079             }
00080         }
00081     }
00082     return *this;
00083 }
00084
00085
00086 //Move operator
00087 SnakeList& SnakeList::operator=(SnakeList&& other) noexcept {
00088     if (this != &other) {
00089         head.reset();
00090         head = std::move(other.head);
00091         tail = other.tail;
00092         other.tail = nullptr;
00093     }
00094     return *this;
00095 }
00096 //sort method
00097 void SnakeList::sortContent() {
00098     if (!head || !head->next) return;
00099
00100     bool swapped;
00101     do {
00102         swapped = false;
00103         Node* curr = head.get();
00104
00105         while (curr->next) {
00106             if (curr->x > curr->next->x) {
00107                 std::swap(curr->x, curr->next->x);
00108                 std::swap(curr->y, curr->next->y);
00109                 swapped = true;
00110             }
00111             curr = curr->next.get();
00112         }
00113     } while (swapped);
00114 }

```

## 4.17 SnakeList.h File Reference

Header file containing the Doubly Linked List implementation for the Snake game.

```
#include <memory>
#include <iostream>
#include <conio.h>
#include <Windows.h>
```

## Classes

- struct **Node**  
*Represents a single segment of the snake's body.*
- class **SnakeList**  
*Doubly linked list for managing snake segments. Implements the Rule of Five and custom sorting/searching.*

### 4.17.1 Detailed Description

Header file containing the Doubly Linked List implementation for the Snake game.

Definition in file [SnakeList.h](#).

## 4.18 SnakeList.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #include <memory>
00007 #include <iostream>
00008 #include <conio.h>
00009 #include <Windows.h>
00010
00015 struct Node {
00016     int x, y;
00017     std::unique_ptr<Node> next;
00018     Node* prev;
00019
00020     Node(int _x, int _y);
00021 };
00022
00028 class SnakeList {
00029     std::unique_ptr<Node> head;
00030     Node* tail;
00031
00032 public:
00033     SnakeList();
00034
00040     void push_front(int x, int y);
00041
00043     void pop_back();
00044
00049     bool isSnakeAt(int x, int y) const;
00050
00051     // Rule of Five implementations
00052     SnakeList(const SnakeList& other);
00053     SnakeList(SnakeList&& other) noexcept;
00054     SnakeList& operator=(const SnakeList& other);
00055     SnakeList& operator=(SnakeList&& other) noexcept;
00056
00058     void sortContent();
00059 };
00060
00061
00062
```

## 4.19 Types.h File Reference

Common enumerations used across the project.

### Enumerations

- enum class `eDirection` {  
    `STOP` = 0 , `LEFT` , `RIGHT` , `UP` ,  
    `DOWN` }  
*Possible movement directions for the snake.*
- enum class `Difficulty` { `EASY` , `MEDIUM` , `HARD` }  
*Difficulty levels that scale gameplay mechanics.*

### 4.19.1 Detailed Description

Common enumerations used across the project.

Definition in file [Types.h](#).

### 4.19.2 Enumeration Type Documentation

#### 4.19.2.1 Difficulty

```
enum class Difficulty [strong]
```

`Difficulty` levels that scale gameplay mechanics.

##### Enumerator

<code>EASY</code>	
<code>MEDIUM</code>	
<code>HARD</code>	

Definition at line 15 of file [Types.h](#).

#### 4.19.2.2 eDirection

```
enum class eDirection [strong]
```

Possible movement directions for the snake.

##### Enumerator

<code>STOP</code>	
<code>LEFT</code>	

RIGHT	
UP	
DOWN	

Definition at line [7](#) of file [Types.h](#).

## 4.20 Types.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00007 enum class eDirection {
00008     STOP = 0,
00009     LEFT,
00010     RIGHT,
00011     UP,
00012     DOWN
00013 };
00015 enum class Difficulty {
00016     EASY,
00017     MEDIUM,
00018     HARD
00019 };
```

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