Project report for the CG 100433 course

Project Title

A 3D Snake Game

Team members

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Abstract

For interest in the classic snake game as well as modern 3D games, we come up with the idea of turning the 2D snake game into 3D version. Using OpenGL and CG techniques including modeling and 3D transformation, we develop a 3D snake game. In this game, players can choose to play in a single mode or a two-opposed-players mode. Apart from typical operations, players can change their view perspective to see around the map and zoom in and out.

Motivation

As we all know, 2D Snake game was popular once before. But with the development of 3D games, 2D version of the games are in danger because 3D can give people different visual effects, which promotes people to choose 3D games. And a good idea suddenly popped out of our mind: Why not change the 2D Snake

game to 3D one? We believe 3D Snake game will become popular again because of its genuine environment, which will bring better experience for players.

Goal of the project

- 全局视角，可以通过键盘转换视角
- 游戏区域缩放
- 通过键盘控制蛇的运动方向，蛇触碰到游戏边界或自己，游戏结束
- 统计玩家分数

Scope of the project

- 贪吃蛇只能在 2D 平面上移动
- 场景环境的真实性

Involved CG techniques

- 3D Transformation & Clipping

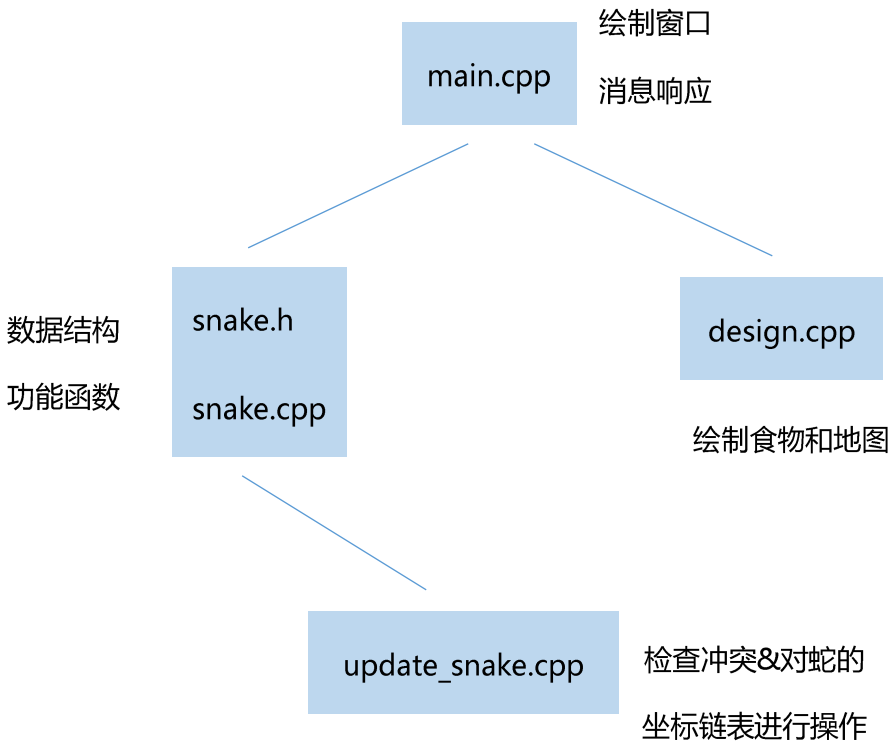
Project contents

- 游戏区域及蛇身体建模
- 地图网格化&整体化，全局视角，游戏区域可缩放
- 键盘控制蛇的运动，蛇触碰到游戏边界或自己，游戏结束；吃到食物时身体长度增加。
- 统计玩家分数。

- 单人模式&双人对抗模式

Implementation

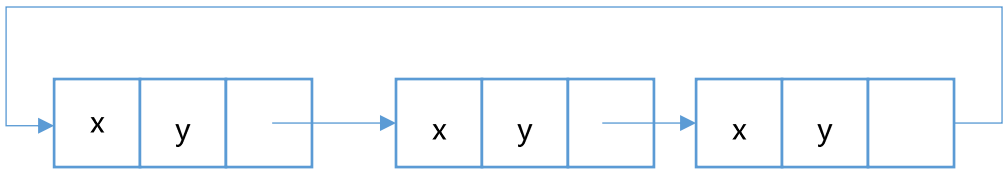
- 程序整体架构



- 蛇的数据结构

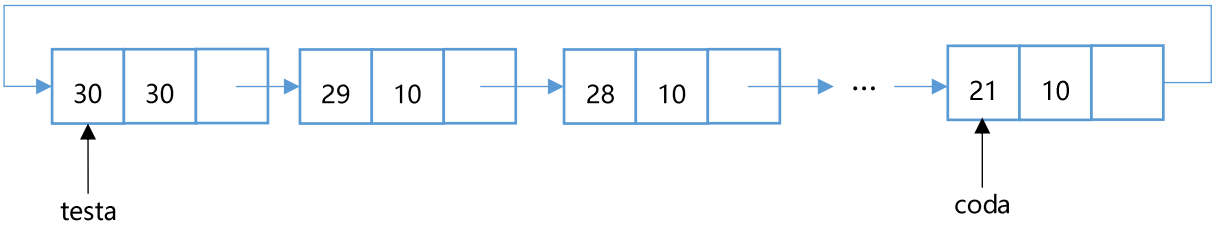
char	moveleft
char	moveright
char	moveup
char	movedown
float	color
bool	scontro
pnode	testa
pnode	coda
char	direction
int	n
int	n2

蛇的坐标由循环链表记录，数据结构中的 testa 和 coda 分别指向蛇头和蛇尾，链表示意如图：

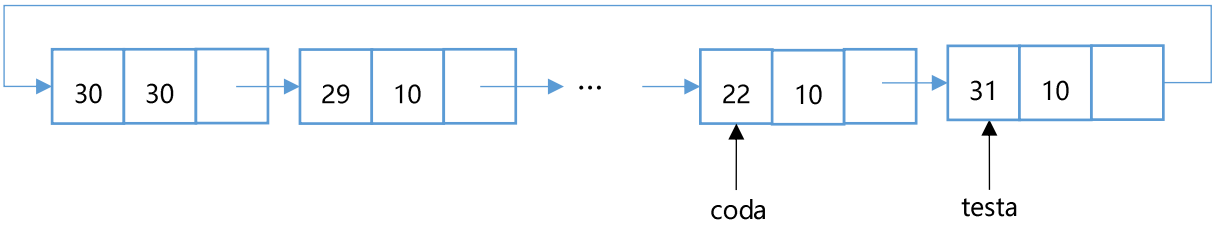


当玩家控制蛇移动时，蛇身所在的坐标发生变化，更新操作如下：

a）蛇的原坐标链表



b）蛇向右移动后的坐标链表



- 冲突检测

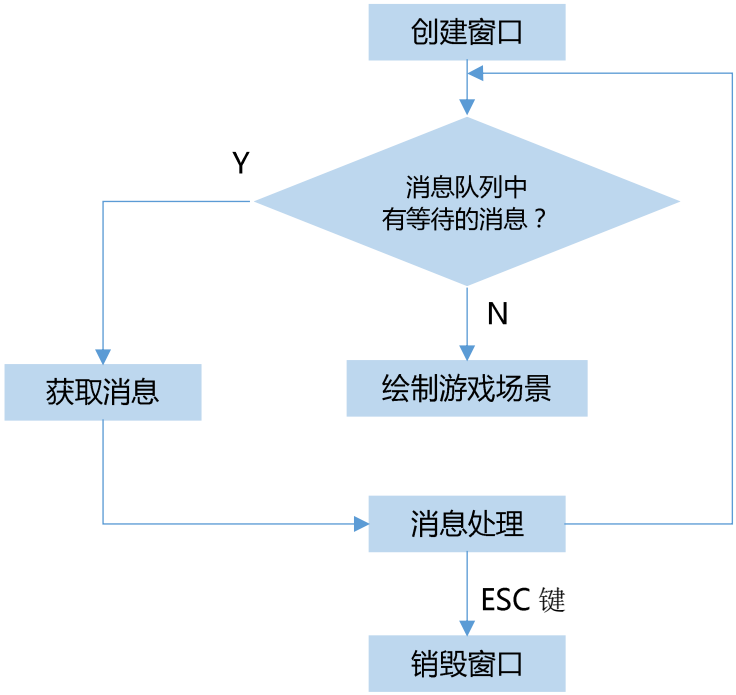
a）当蛇触碰到游戏区域的边界时

```
//scontri
if(!(testa->p.x+1>0&&testa->p.x+1<n2+1&&testa->p.y+1>0&&testa->p.y+1<n2+1))
    collision=true;
```

b）当蛇触碰到与自身或另一条蛇时

```
for(i=0;i<numgioc;i++)
   if(controllalista(sn[i]->testa,testa->p.x,testa->p.y))
    collision=true;
```

- 程序窗口的构建

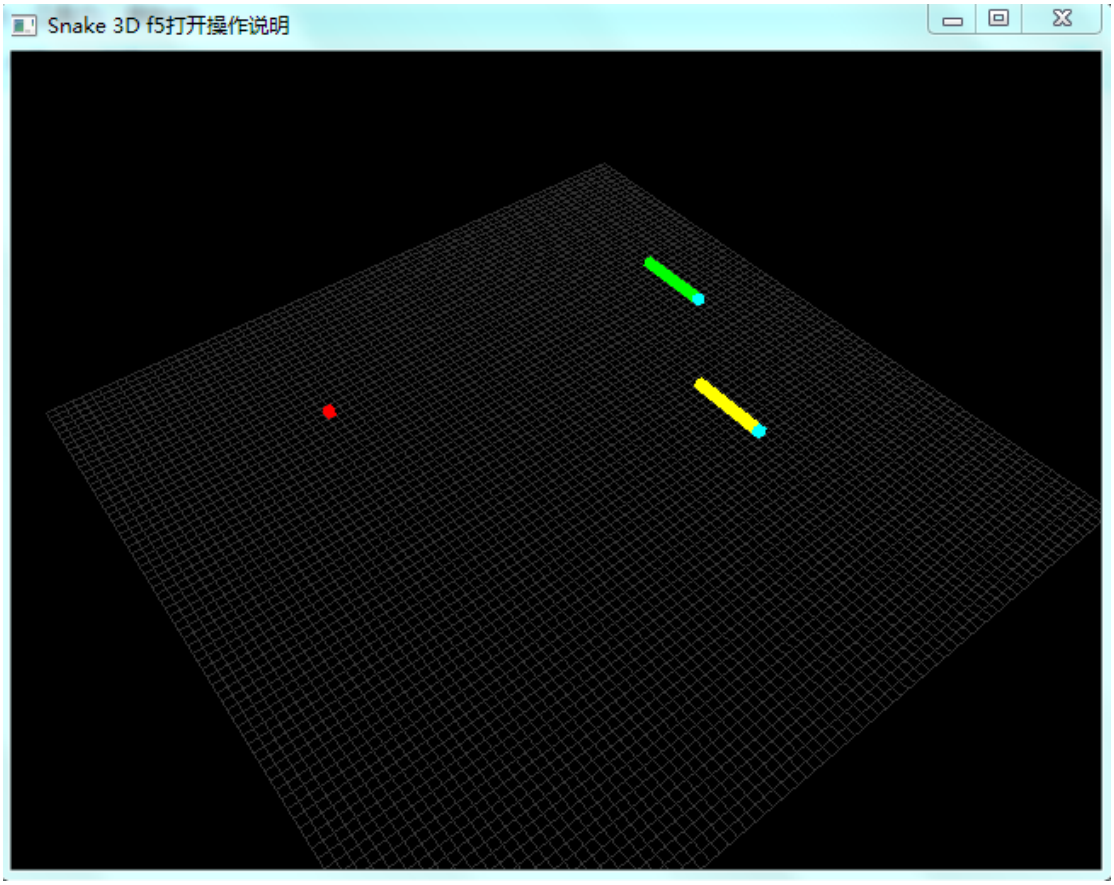


其中消息的获取与处理由窗口回调函数 LRESULT CALLBACK WndProc( )完成：

```
case WM_KEYDOWN:
{
    keys[wParam] = TRUE;
    return 0;
}

case WM_KEYUP:
{
    keys[wParam] = FALSE;
    return 0;
}
```

```
if (keys[VK_UP]){
    xrot += 1.0f;
}

if (keys[VK_DOWN]){
    xrot -= 1.0f;
}
if (keys[VK_LEFT]){
    yrot += 1.0f;
}

if (keys[VK_RIGHT]){
    yrot -= 1.0f;
}
```

Results



Roles in group

- 程晨：

    蛇的数据结构及冲突检测

- 王倩倩：

    整体架构及场景绘制

- 徐柳依、张天成：

  消息的获取与处理

- 张焕彬、王勇斌：

  蛇坐标链表的更新修改

References

[1] Dave S. , Graham S ., John K ., Bill L . OpenGL Programming Guide: The Official Guide to Learning OpenGL〔M〕.

[2] Hearn, Baker, Carithers. Computer Graphics with Open GL〔M〕. Fourth Edition.