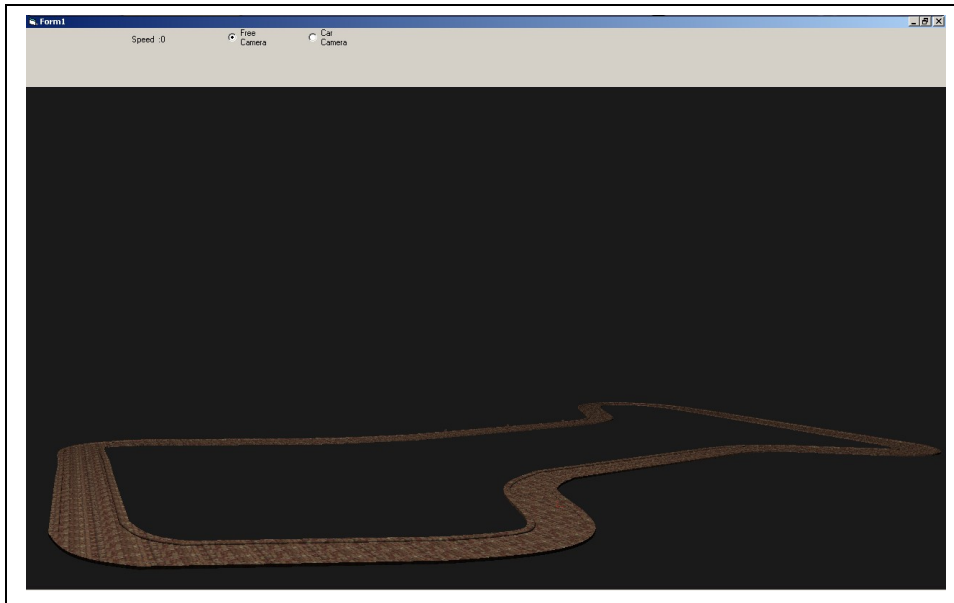


## Visual Basic Project



## Introduction

At the beginning, my idea was to create a small race game in 3 dimensions with Visual Basic without any external library. However after some research on Internet to see how computer game was done , I notice most of the game in 3 dimensions don't use the graphics function in VB . Visual Basic use Win 32 API to display each commands. This library is not designed for 3 dimensions games in real time because it's doesn't use the Graphics card properly and most of the job is done by software. Two mains library can be used to add the support of the graphics card.

These tow libraries are Opendgl and DirectX. They can greatly enhance the quality of your game. I choose to use Opendgl because of its efficiency and simplicity.

## 1. Some word about OpenGL

- The main advantage of OpenGL for 3D application is to draw objects with hidden surface. OpenGL has an internal buffer called Depth buffer. Each depth of each pixel is stored inside. Hence pixels with larger depth-buffer values are overwritten by pixels with smaller values. This algorithm takes a lot of computation time. Fortunately, this entire job is directly done by hardware with the graphics card.

- Another appreciable advantage of OpenGL is to work with double-buffer algorithm. We draw the image in buffer 1 when buffer 2 is displayed and then we swap these two buffers and we draw the image in buffer 2 when buffer 1 is displayed.

- OpenGL library contains many functions to build 3D objects and display them.

OpenGL provides all the functions to draw any objects in 3 dimensions. Let's assume we want to draw a line:

```
glBegin(GL_LINE)
glVertex3f(0,0,0)
glVertex3f(1,1,1)
glEnd()
```

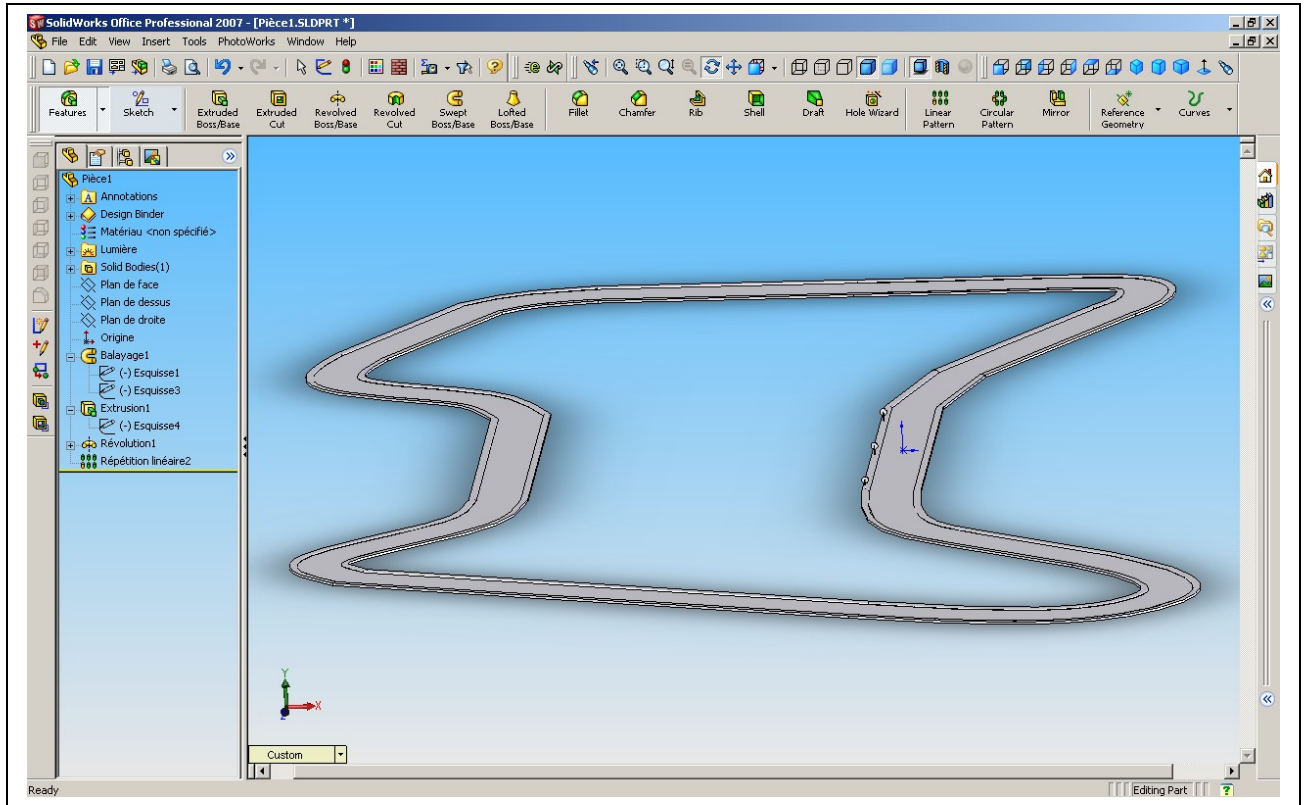
OpenGL provides functions to move the camera. Let's assume we want to see from Eye to Direction with DirectionUp.

```
gluLookAt(eyex, eyey, eyez, Directionx, Directiony, Directionz, DirectionUpx, DirectionUpy, DirectionUpz)
```

## 2. Some word about the 3 dimensions Objects

To create the main object ( the circuit ) , I have used SolidWorks.

I  
can



export the object in two different format: STL and Obj

### STL file : a example

```
solid Geom
  facet normal -1.000000e+000 0.000000e+000 0.000000e+000
    outer loop
      vertex 4.392696e+003 2.892471e+001 6.270965e+003
      vertex 4.392696e+003 2.892471e+001 3.783628e+003
      vertex 4.392696e+003 1.446235e+001 6.270965e+003
    endloop
  endfacet
```

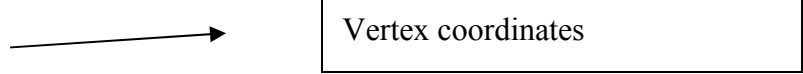
.....

This file contain all the object's triangle.

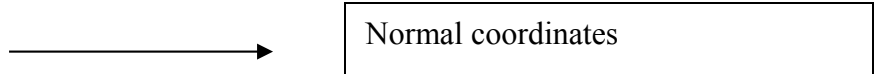
**OBJ file : a example**

```
# Object "piece01":  
# ComRec:  
g mesh01
```

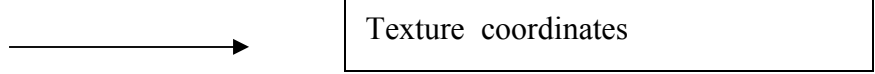
```
v 0 0 0  
v 0 1 0  
v 1 1 0  
v 1 0 0
```



```
vn 0 0 1  
vn 0 0 1  
vn 0 0 1  
vn 0 0 1
```



```
vt 0 0 0  
vt 0 1 0  
vt 1 1 0  
vt 1 0 0
```



```
f 1/1/1 2/2/2 3/3/3 4/4/4
```



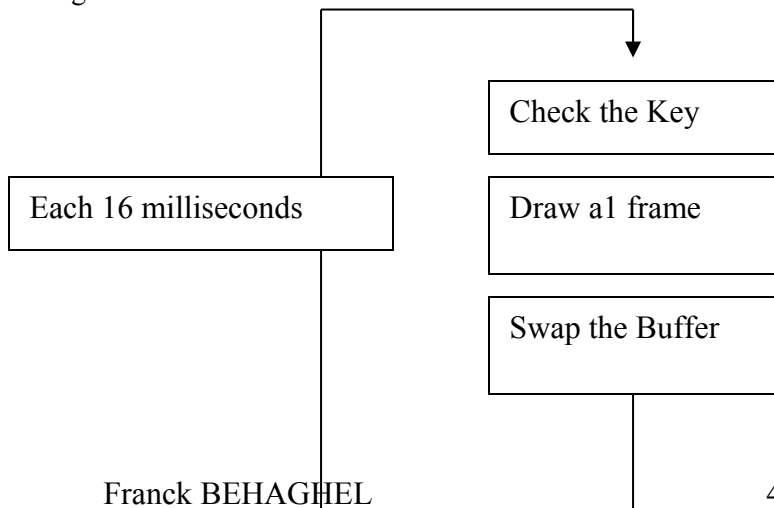
Each face (triangle or quadrilateral) is given by a set of indices to the vertex/texture/normal coordinate array that precedes this

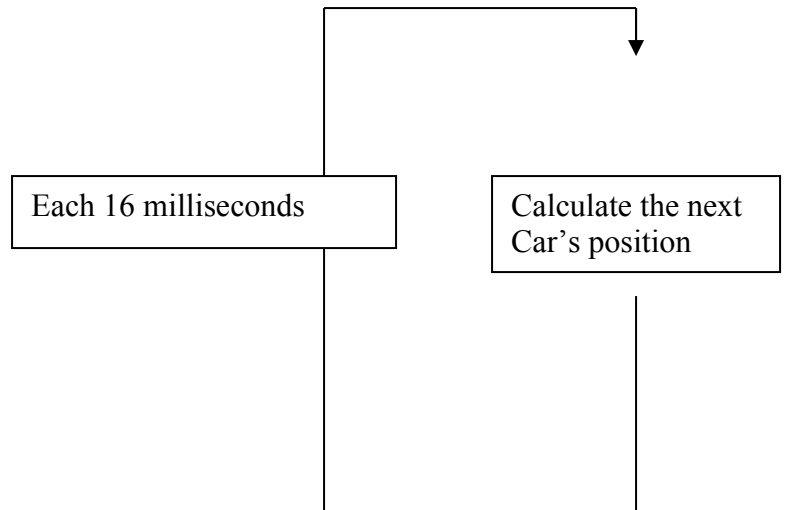
This structure is much more powerful than the previous one. We have for each vertex 1 normal and we have also the texture coordinate.

I have written in one Module all the function in order to read and then store in memory all of this file.

**3. The Program**

I use a timer to control the frame rate of the game.





#### 4. Some word about the Key

The main problem with the key is to detects when two different key are pressed at the same time. To solve this problem, I use a function in Win 32 API:

```
Private Declare Function GetAsyncKeyState Lib "user32.dll" (ByVal vKey As Long) As Integer
```

For example :

```
If Not GetAsyncKeyState(VK_G) = 0 Then  
    Call The_Key_G_is_pressed()  
End If
```

#### 5. How to know whether or not the car is inside the circuit

My program uses 2 files. The Obj one is to draw the circuit on the screen. The obj file is more accurate and heavier. The STL file is the model of the circuit that is use to know is the player is inside or outside.

For some reason, if I use the obj file to do this task, it takes too long time.

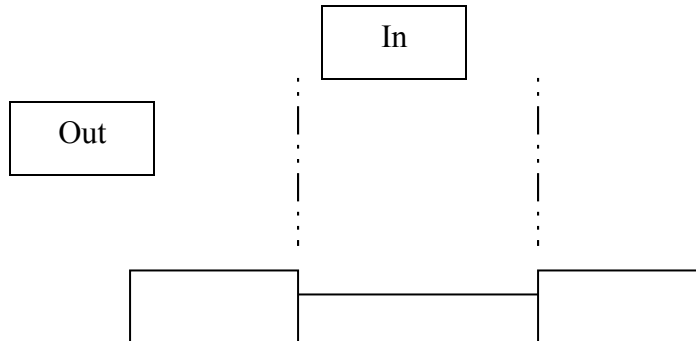
In order to know whether or not the player is outside, I create one function as following:

## Visual Basic Project: A 3D racing game

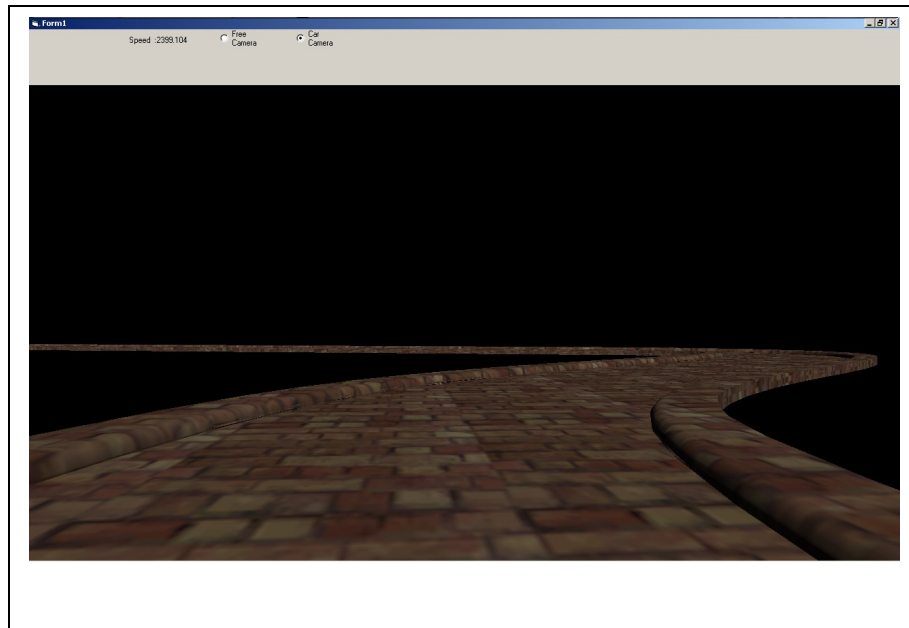
```
Function IsInside(T As Triangle, P As Vertex) As Boolean
```

This function let me know whether one point is inside a triangle. Thank to this function, I can test each triangle and found where is the car .

**Example 1:** The circuit.



## Conclusion



This project was a chance to learn more about Visual Basic. I really appreciate to be able to do it. Even if, it was not some time as easy as I was thinking, I have faced the entire problem one by one. Obviously, this can still be improved, however at this state, this can regard as a first release.