

Homework #1: 2D Polygon Fountain

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Abstract

In this assignment, we will create a virtual 2D fountain that emits a lot of polygons, called polygon fountain, as Fig. 1.

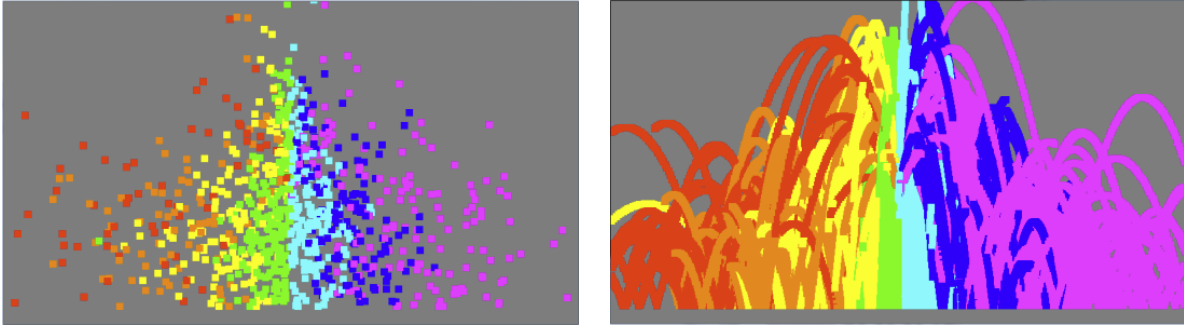


Fig. 1. Examples of polygon fountains

1 INTRODUCTION

Suppose the emitter of the polygon fountain located in the 2D position $P_0 = (x_0, y_0)$. When the emitter emits a polygon with the initial velocity $v = (v_x, v_y)$, the following is the location of the polygon at time t ;

$$P_t = \left(x_0 + v_x t, y_0 + v_y t - \frac{1}{2} g t^2 \right), \quad (1)$$

where g is the gravity constant (i.e., $9.8m/s^2$).

For each polygon, you may change the initial velocity, by using random functions. The goal of this homework is to generate your own polygonal fountain in an artistic way. Your program must satisfy the following criteria. It is also ok for you to addup your own criteria additionally.

- 1) Your program visualizes a part of the scene with the polygonal fountain. Initially, the part of the scene should be bounded by $x \in (-5, 5)$ and $y \in (0, 10)$.
- 2) You can change your camera settings by pressing the following keys.
 - '←' key: camera moves to $-x$ direction.
 - '→' key: camera moves to $+x$ direction.
 - '↑' key: camera moves to $+y$ direction.
 - '↓' key: camera moves to $-y$ the down direction
 - '+' key: camera zoom-ins the scene.
 - '-' key: camera zoom-outs the scene.
 - 'Home' key: camera recovers the initial settings.
- 3) In your program, you can control the number of polygons emitted from the polygonal fountain, with the context menu.
 - # of polygons = 10
 - # of polygons = 50
 - # of polygons = 100
 - # of polygons = 500
 - # of polygons = 1000

Notice that you visualize only a part of the scene with the polygonal fountain, in general. As a result, you must develop your own way to optimize the program by using the fact that your program only visualizes a part of the scene.

2 WHAT YOU LEARN

From this homework you can learn about the followings

- How to visualize a 2D object with OpenGL
 - Use glBegin/glEnd with GL_POLYGON or GL_QUADS
 - Use glColor for changing each polygon color.
- How to update window displays with FreeGLUT.
 - Use glutDisplayFunc, glutIdleFunc, glutPostRedisplay
- How to use keyboard callback functions with FreeGLUT.
 - Use glutKeyboardFunc, glutSpecialFunc
- How to make a menu with FreeGLUT.
 - Use glutCreateMenu, glutAddMenuEntry, glutAttachMenu

3 DEADLINE AND MISC. (EXTREMELY IMPORTANT!!!)

- Your homework must be submitted to 가상강의실 until 23:59 on April. 8.
- You should compress the followings into a **tar.gz** or **zip** file whose name is OOOOOOOO_HW01.tar.gz (OOOOOOOO should be your student ID).
 - 1) Your source files
 - 2) Makefile
- **Your source codes must be complied with a make command in CentOS 7.**
- If you ask some questions to me, please utilize the office hours. It is also fine that you contact T.A. for asking some questions about the homework.