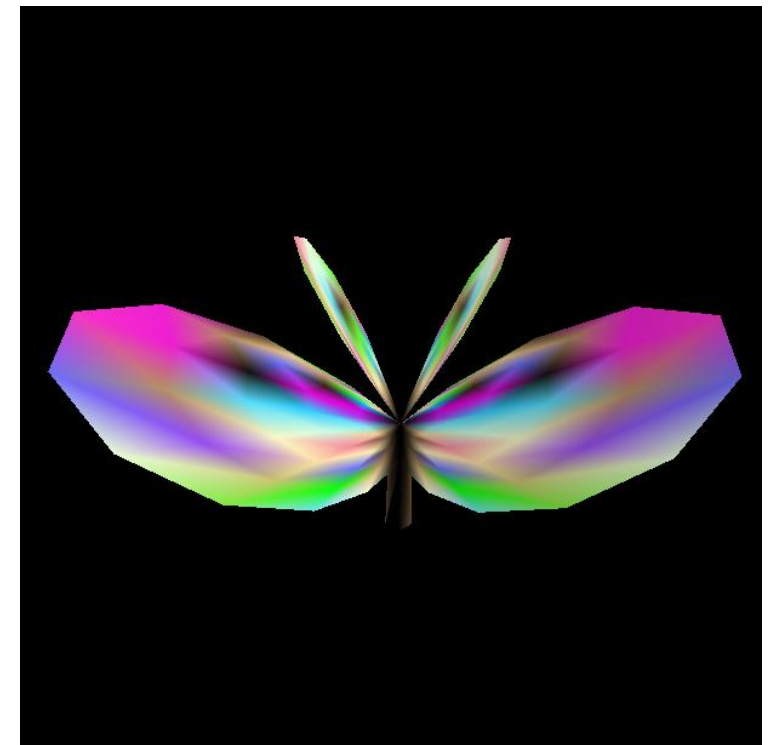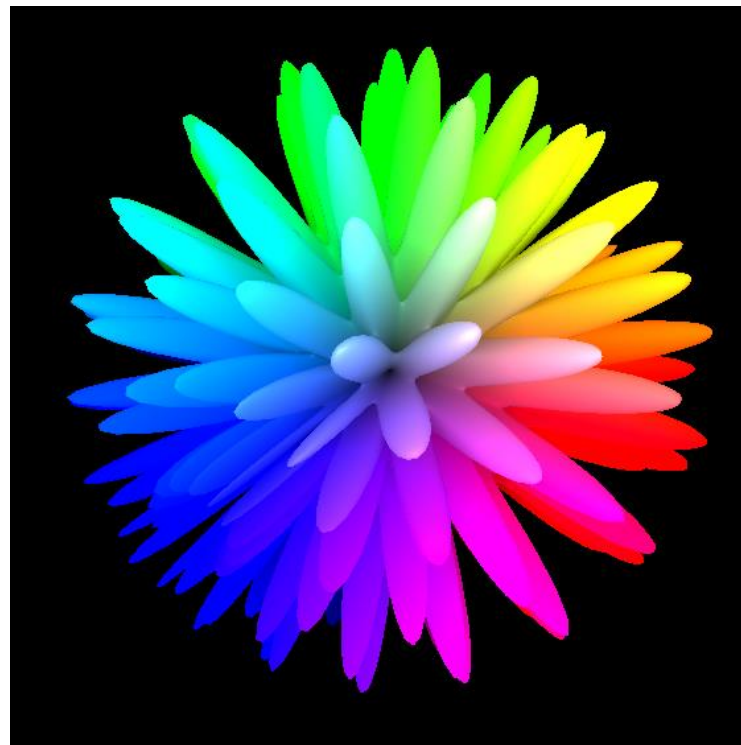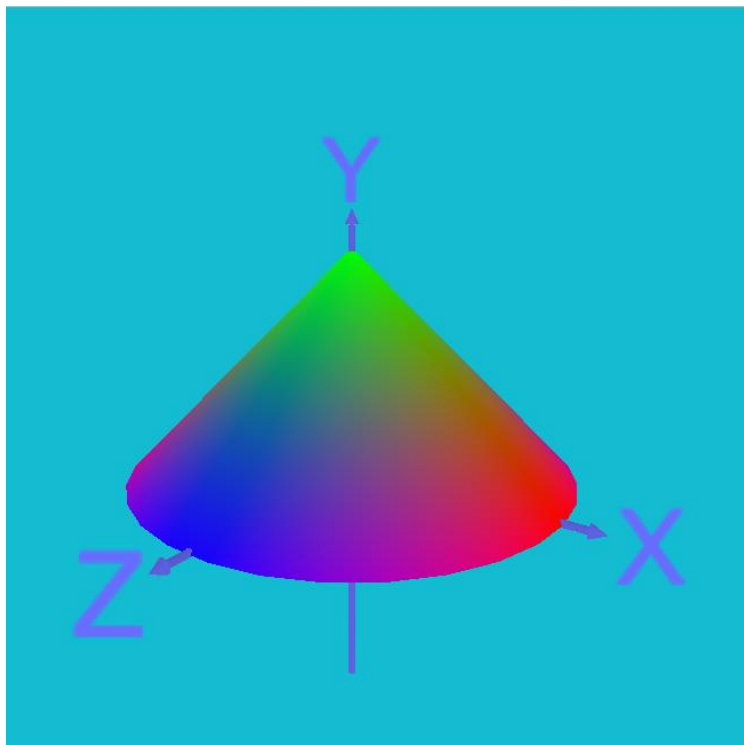# Shape Explorer

Displaying curves, surfaces and solid objects in Unity 3D system

Student: Beh Wei Feng   Supervisor: A/P Alexei Sourin

Project Objectives:

Shape Explorer was created as a tool for visualizing objects using mathematical equations. The tool was meant for teaching the CZ2003 Computer Graphics and Visualization course in Nanyang Technological University. It acts as a replacement of FVMRL, is a function-based extension of Virtual Reality Modelling Language to allow for time-dependent shape modelling on the Web. Shape Explorer has been successful in its implementation as it provides a graphical user interface for students to model objects that can be represented by parametric or implicit equations. Shape Explorer also allows for additional customizations to the object, by adjusting its properties, such as color and transparency. However, a huge bottleneck experienced during the development of Shape Explorer is its inability to implement procedural colors on the object, which this project seeks to resolve. The introduction of procedural colors will aid students tremendously in understanding color visualization using mathematical formulas

Procedural colors was successfully implemented using vertex colors. For an object to be generated in Shape Explorer, the algorithm will generate a list of vertices based on the object's equations and application's settings. The vertices will then be used to generate the mesh of the object, before the material holding the object's color properties is being applied to it. Instead of assigning colors to the material, vertex coloring is used to assign a color to each individual vertex of the mesh. The color at each vertex will be based on equations entered by the user, for each color – red, green and blue. These equations can be a function of x, y, z and t, creating procedural colors that varies with the vertex's co-ordinate values and parametric time t.