Object Classes used for Triangulation

Vertex

represents a point in 3-dimensional space.

Properties

x	*Distance to the east(+) or to the west(-) from an arbitrary y-axis where x is assumed to be zero.*
y	*Distance to the north(+) or to the south(-) from an arbitrary x-axis where y is assumed to be zero.* The x- and y-axis together define a flat horizontal plane.
z	*Elevation distance above(+) or below(-) the horizontal plane*. These three properties must use an identical length-unit of measure. This unit of measure is then applied throughout.
xRot	*x as seen by the (possibly rotated) camera*
yRot	y *as seen by the (possibly rotated) camera*
zRot	z *as seen by the (possibly rotated) camera*
IsTemp	*Indicates that the point is a temporary point. Temporary points are created during the triangulation process.*
CoincidesWith	*Indicates that the point's projection onto the horizontal plane coincides with another point's projection*.

Method

MakeVertex	*Creates a new vertex instance.*

CreatedBy self, Side, Terrain

UsedBy self, Side, Triangle, Terrain

Side represents a straight line segment in 3-dimensional space.
(so named because it will be used as the side of one or more triangles)

Properties

FromPoint	*Starting vertex of the line.*
ToPoint	*Ending vertex of the line.*
Length	*Distance between FromPoint and ToPoint.*
InvSlope	*Inclination of the projection onto the horizontal plane of a line which is a perpendicular sector of the line.*
CoincidesWith	*Indicates that the line's projection onto the horizontal plane coincides with another line's projection.*
Center	*Equidistant vertex between the starting and ending vertices..*

Method

MakeSide	*Creates a new side instance.*

CeatedBy self, Triangle, Terrain

UsedBy self, Triangle, Terrain

Triangle

represents a flat (non-curved) triangle in the 3-dimensional space.

Theorems:

a. In a triangle the sum of two sides is larger than the third side.

b. If and only if the sum of two line segments is larger than a third segment then those three segments can be used to form a triangle.

These theorems exclude degenerated triangles, that is, triangles with a 180° angle, or in other words: If three points lie on a straight line then they do not constitute the corners of a triangle. A point in this context is the projection of an xyz-vertex onto the horizontal xy-plane as defined by the x- and y-axis.

However, this software tries to deal with degenerated triangles, but the algorithm may fail under certain circumstances. The suggested solution is to minimally perturbate or offset one of those three points in a beneficial xy-direction.

Properties

CornerA	*Vertex which represents corner A of the triangle.*
CornerB	*Vertex which represents corner B of the triangle.*
CornerC	*Vertex which represents corner C of the triangle.*
SideA	*Line segment which represents side a of the triangle.*
SideB	*Line segment which represents side b of the triangle.*
SideC	*Line segment which represents side c of the triangle.*
Area	*The area surrounded by SideA, SideB, and SideC in square-units of measure.*
IsTemp	*Indicates hat the triangle is a temporary triangle. Triangles are temporary if at least one corner is represented by a temporary vertex.*
CCIncludes	*Indicates that a vertex's projection onto the horizontal plane is within or on the boundary of the triangle's circumcircle. The circumcircle is the unique circle which goes through all three corners of the triangle's projection onto the horizontal plane. The circumcircle is represented by it's center and length of radius, the center in turn is represented by it's x- and y-coordinates in the horizontal plane. A degenerated triangle's circumcircle includes all vertices in the set of vertices.*

Method

MakeTriangle	*Creates a new triangle instance.*

CeatedBy	self, Terrain
UsedBy	self, Terrain, (external)

Terrain represents the terrain to be triangulated.

Properties

Vertices	*Unordered set of vertices.*
Triangles	*Unordered set of triangles.*
TotalArea	*Accumulated area of all triangles in the set of triangles.*

Methods

AddVertex	*Adds a vertex to the set of vertices.*
Triangulate	*Performs the triangulation and creates the set of triangles. Returns the number of triangles in the set.*
Reset	*Removes all vertices and triangles from the corresponding sets.*

Event

Progress	*Occurs during the triangulation process and communicates the percentage of completion.*

CeatedBy external

UsedBy external

Notes

- **Arithmetic** is performed using 64-bit floating numbers in IEEE format throughout. Their range is

  -1.79769313486232e+308
  :
  -4.94065645841247e-324
  :
  0
  :
  +4.94065645841247e-324
  :
  +1.79769313486232e+308

  with an accuracy of at least 14 digits.

- **Infinity** is defined internally as $\mathbf{10^{11}}$; the **usable range of numbers** therefore is approximately

  $$\mathbf{-2 * 10^{7} \text{ through } +2 * 10^{7}}$$