Dular Mestes

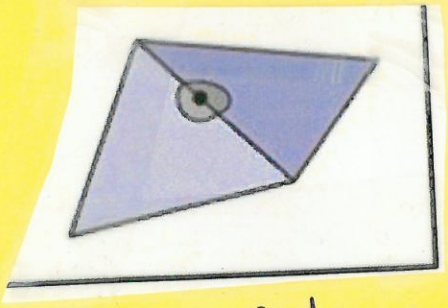
Feb 25

Nomes:
- triangular mestes
- triangle meshes
- triangulated irregular networks (TINs)

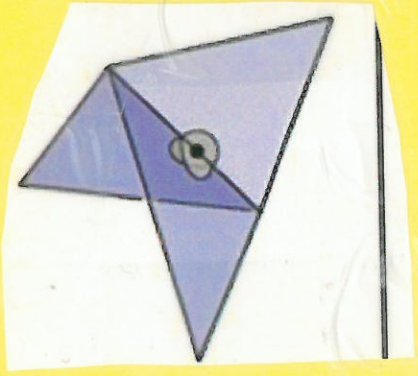
mestes are (discrete reps) of continuous sufaces
=> make more efficent algs and Data structs

mesh topology: how Δs are connected together
w/o vertex positions

manifold: the neighborhood around any point can be "smoothed out" to a flat surface
(2-manifold)



manifold

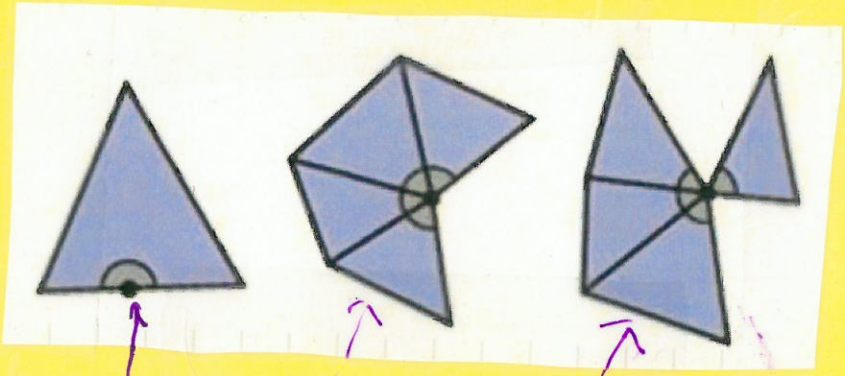


non-manifold

manifold w/ boundary

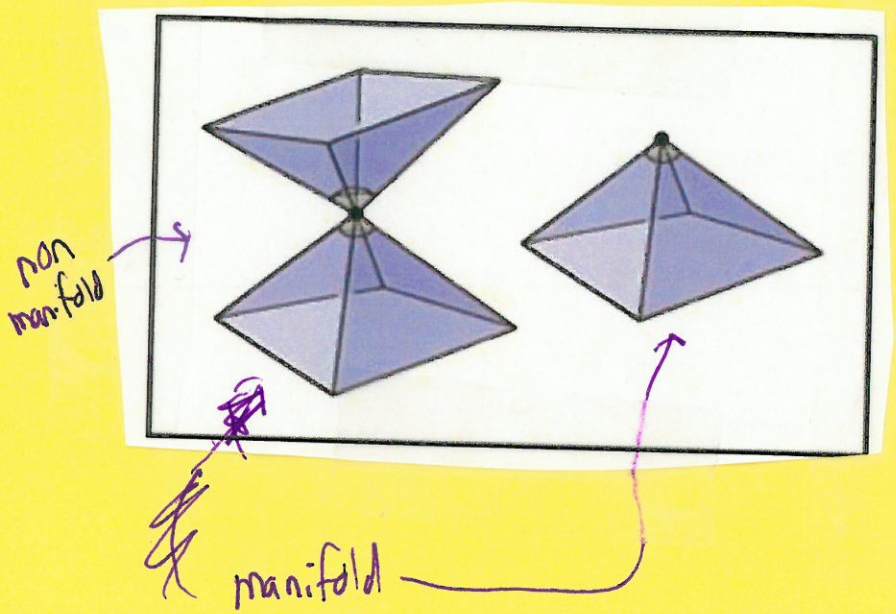
1) every edge used by 1 or 2 Δs

2) every vert connects to single edge connected set of Δs



manifold w/ bdd

non-manifold w/ bdd



Check if object is a manifold!

1) check if every edge is shared by 2 Δs

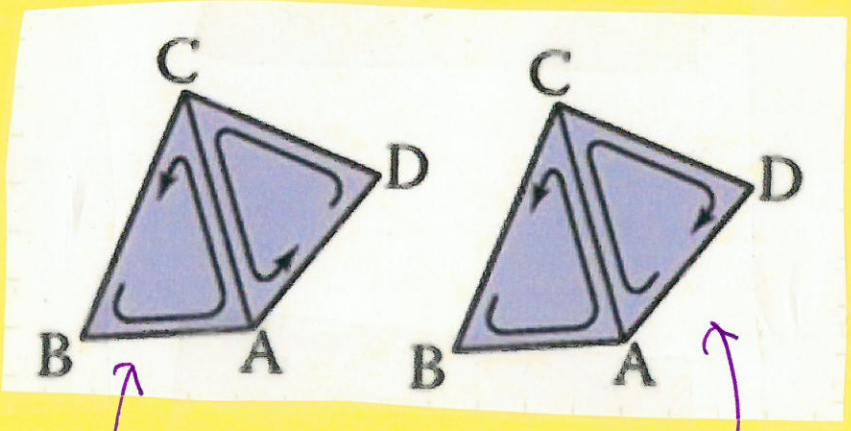
2) check if every vertex
   1 loop of Δs around it

Orientation: distinguish between inside/outside or front/back

- defined by order of verts
- front side is Δ w/ verts ordered CCW

$t = \{a\ c\ b\}$

$t' = \{a\ b\ c\}$

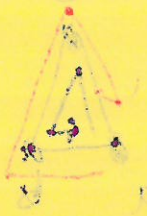


consistently oriented!

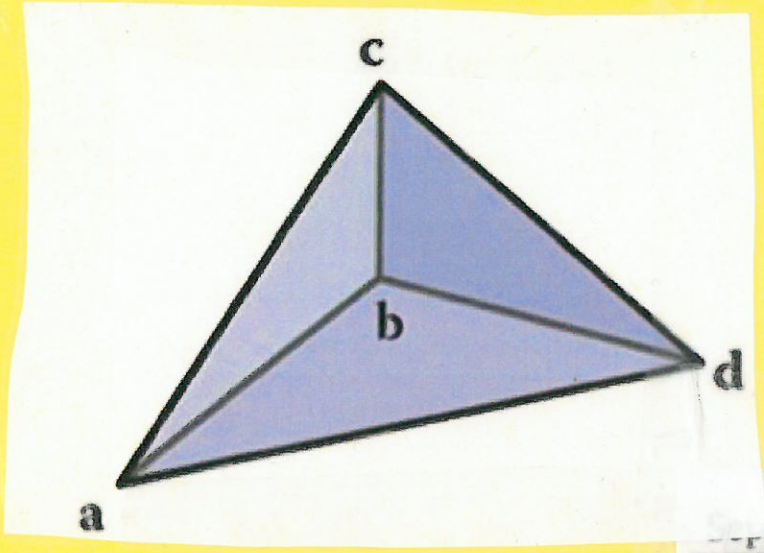
inconsistent

all Δs aggree on the side that is front

e.g. every adj Δ has some orientation



```
Triangle {
    vector3  vertexPositions[3];
}
```



a: 2x

b: 3x

c: 2x

d: 2x

arate triangles:

#	Vertex 0	Vertex 1	Vertex 2
0	(a_x, a_y, a_z)	(b_x, b_y, b_z)	(c_x, c_y, c_z)
1	(b_x, b_y, b_z)	(d_x, d_y, d_z)	(c_x, c_y, c_z)
2	(a_x, a_y, a_z)	(d_x, d_y, d_z)	(b_x, b_y, b_z)

Alt:

```
Triangle {
    Vertex& v[3]
}
```

```
Vertex {
    vector3 position
}
```

```
IndexedMesh {
    int *Ind[nt][3]
    vector3  verts[nv]
}
```

Shared vertices:

Triangles		Vertices	
#	Vertices	#	Position
0	(0, 1, 2)	0	(a_x, a_y, a_z)
1	(1, 3, 2)	1	(b_x, b_y, b_z)
2	(0, 3, 1)	2	(c_x, c_y, c_z)
		3	(d_x, d_y, d_z)

Which rep uses less spaces

n_t # of triangles

n_v # of verts

Δ list: 3 verts per Δ

3 floats per vert

$9 n_t$: total space

Indexed mesh:

1 vec3 per vertex

3 floats per vec3

3 ints per Δ

total space:

$3 n_v + 3 n_t$

each Δ has 3 verts

each vertex is connected to ~6 Δs (on average)

$\Rightarrow n_t \approx 2 n_v$

to compare

- Δ struct: $18 n_v$
- index mesh: $9 n_v$