A Compact Encoding of Plane Triangulations with Efficient Query Supports

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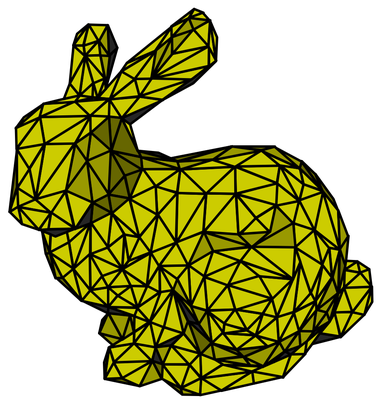
Motivation

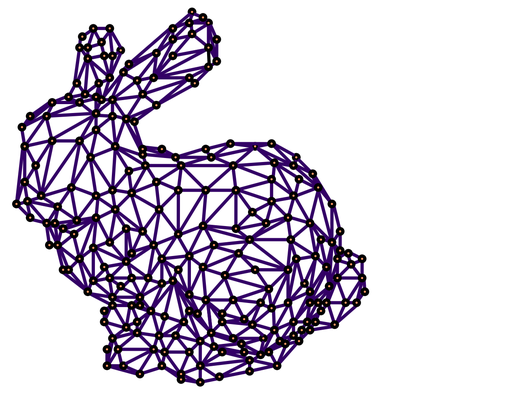
A *fine* 3D object is represented as *large* plane triangulation

A *compact* representation



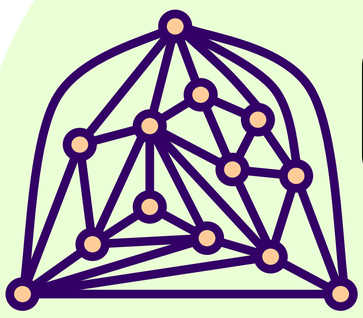
3D object

Representation as plane triangulation



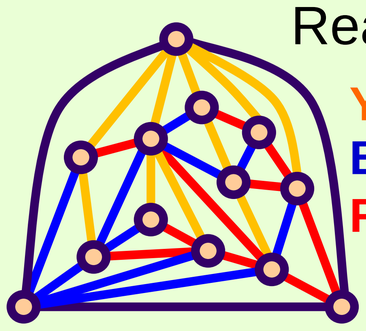
Encoding Ideas

n : # vertices
m : # edges



Plane triangulation

（A plane graph in which every face is a *triangle*）



Realizer

Yellow tree
Blue tree
Red tree

Decode

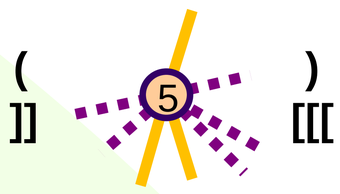
O(*n*) time

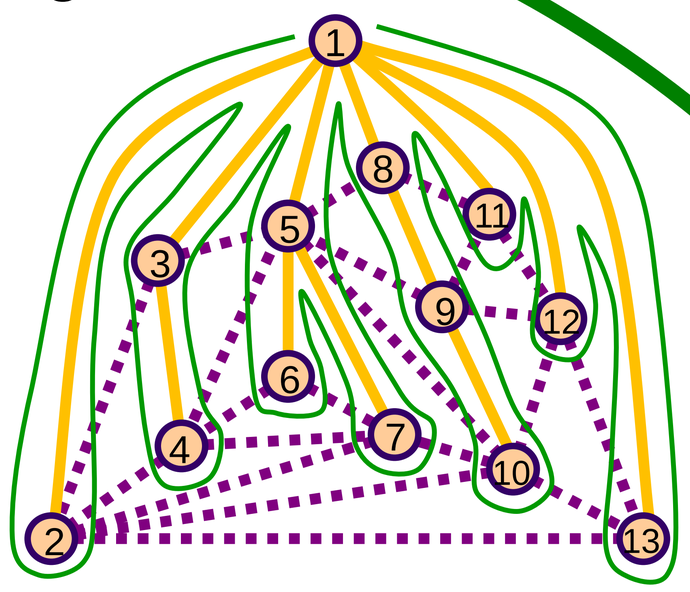
Encode

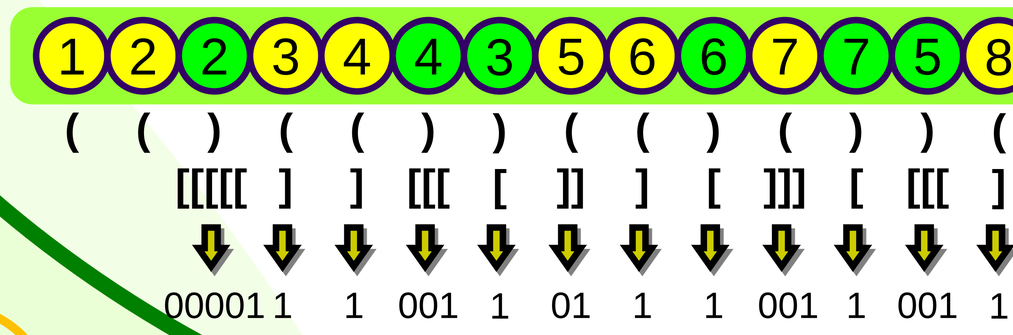
Keypoint

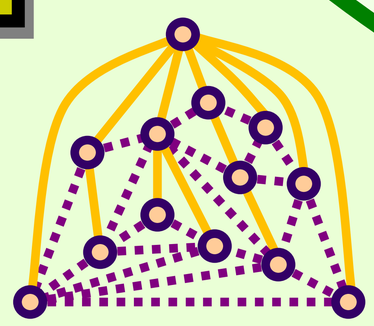
Depth first search
（drawn by *green line*）

For each vertex …









- Spanning-tree
  （**Yellow lines**）
- Non-spanning-tree edges
  （**Purple lines**）

Compact representation of plane triangul.

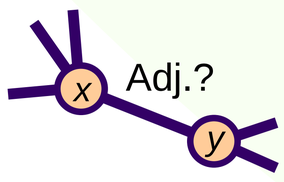
Binary string（6*n* bits）

```
110110011010011100010101000000111001101110011001110010101101100110011001
```

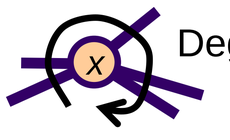
Query supports

With a help of *auxiliary table* of o(n) bits, we can support a variety of queries in O(1) time

- Adjacency query

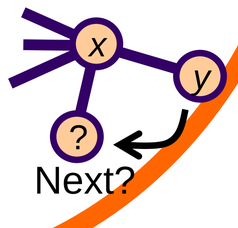


- Degree query



- Clockwise neighbour query

（*k*-th clockwise neighbour query）



Known results

Authors	Size（bits）	Published in
Chuang, Garg, et. al.	7*n* + o(*n*)	Proc. ICALP (1998)
Aleardi, Devillers, et. al.	4.35*n* + o(*n*)	Proc. WADS (2005)
Aleardi, Devillers, et. al.	3.24*n* + o(*n*)	Theoretical Computer Science (2008)
Ours	6*n* + o(*n*)	Information Processing Letters (2010)