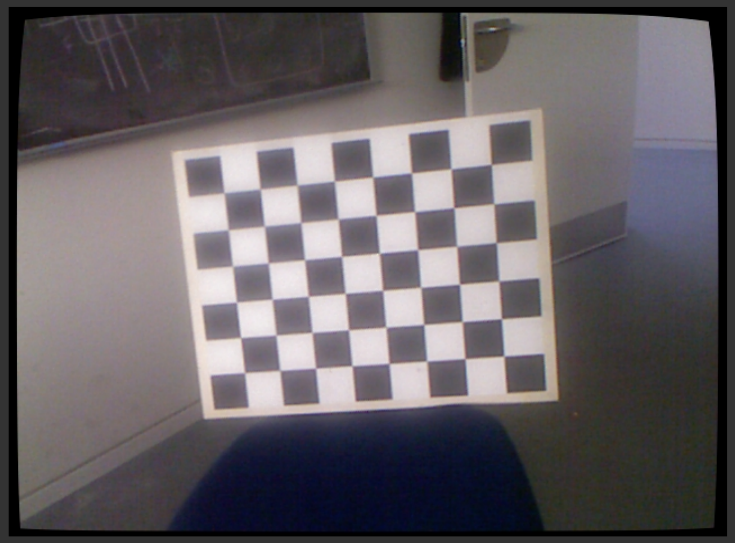
Depth image recognition using isomorphic graph theory

Our project...

- We try to construct a mesh of the world using the data from a depth sensing camera.
- Having the depth images
- Transforming to normal images
- Apply billboard concept (each region / plane in different color)



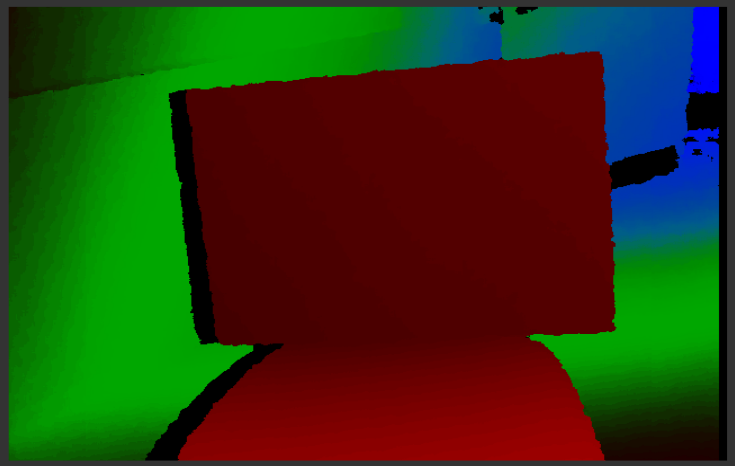
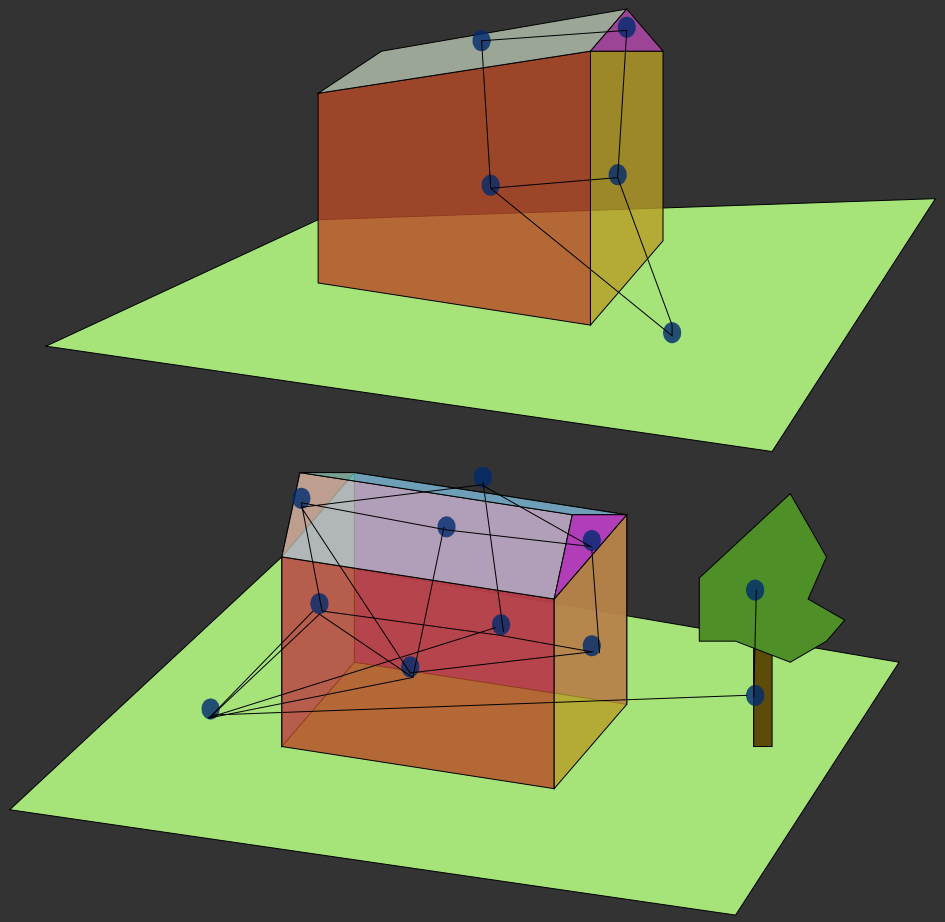
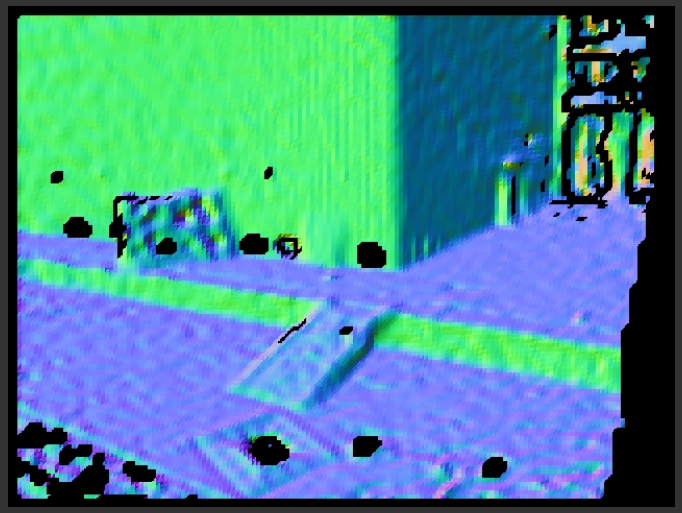


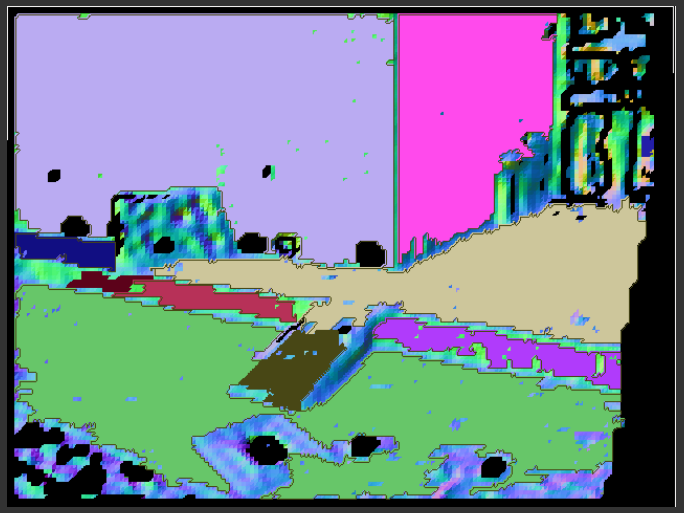
Image == sub-graph?



- Lets assume that we can perfectly recognize objects in an image
- The image graph is a sub-graph of the real world

Image analysis





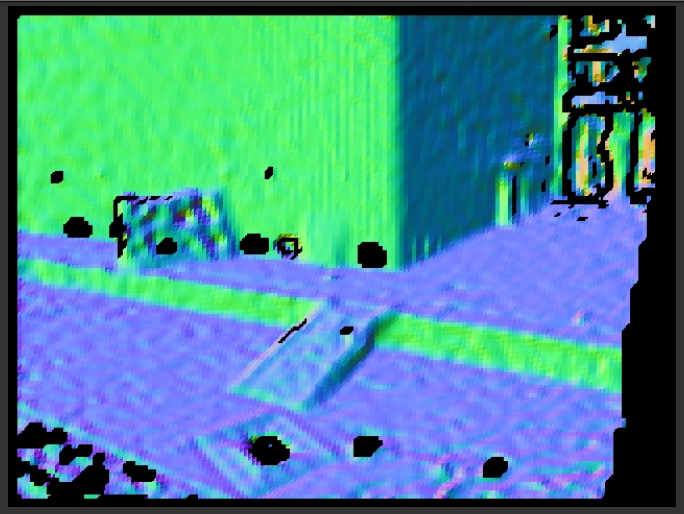
RGB Images

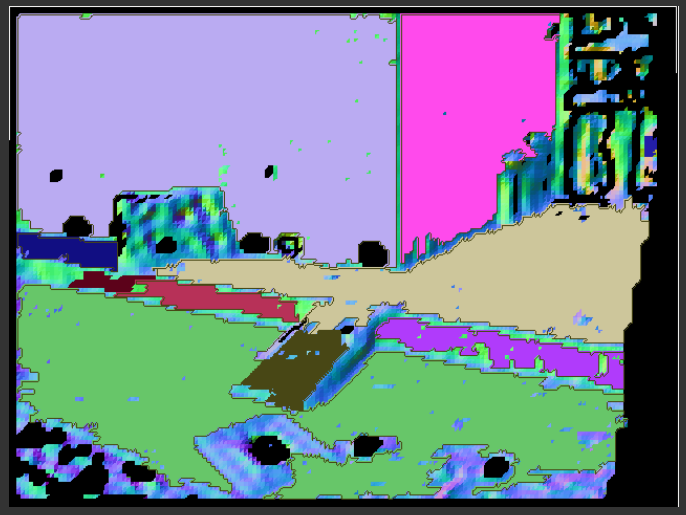
Normal Maps

Region Growing Images

Graph-based object recognition

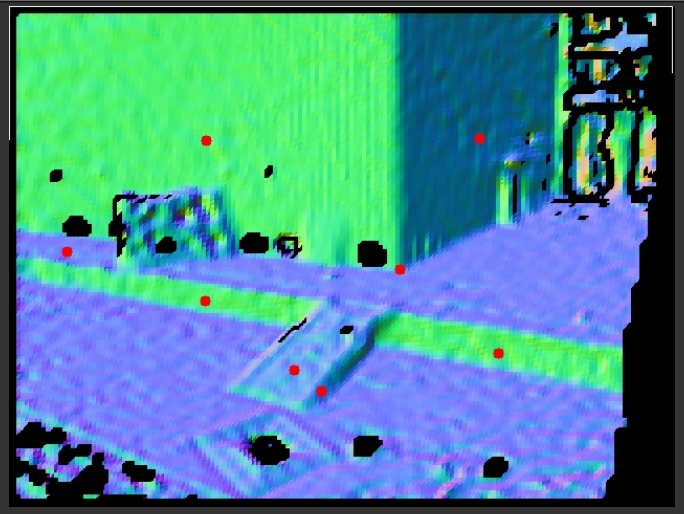
- Objects can be matched using region growing
- Each object in image → Node
  - RGB histogram is the “color” of the node
  - Average color pixel of each Node(region)
- Edges are assigned to neighbouring regions

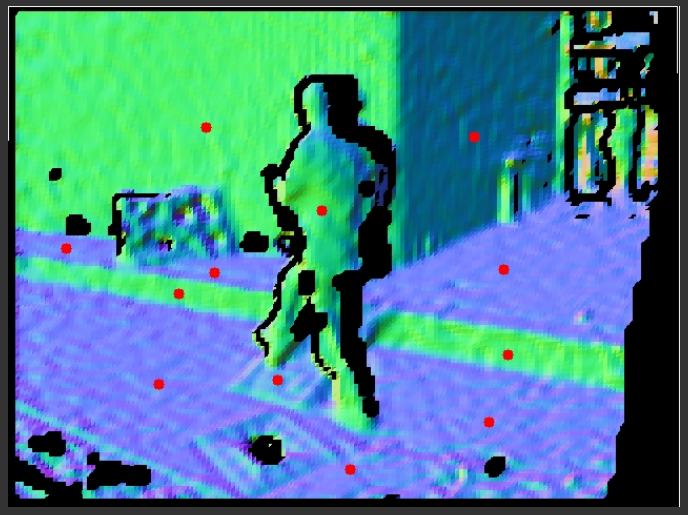




Graph-based object recognition (2)

- In image sequences, nodes represent objects.
- The nodes of the graph can be used for pose estimation
- Saved they can be used for global positioning

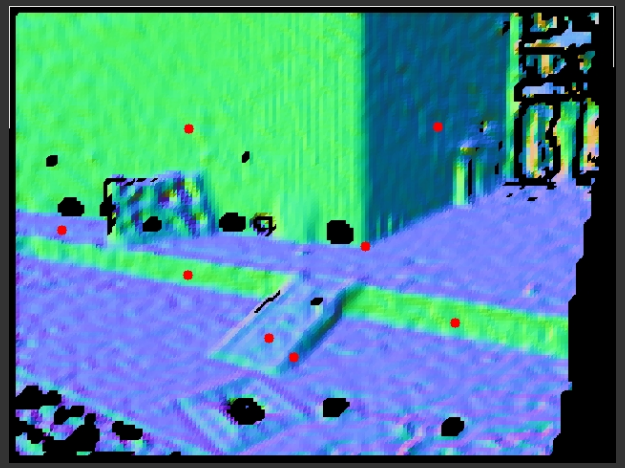


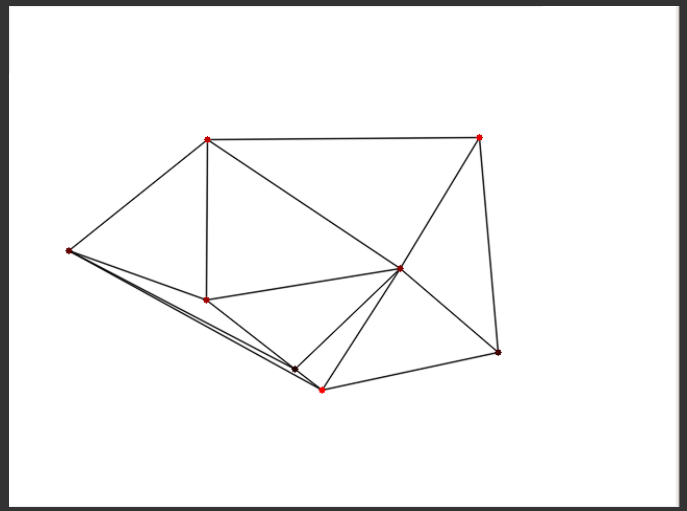


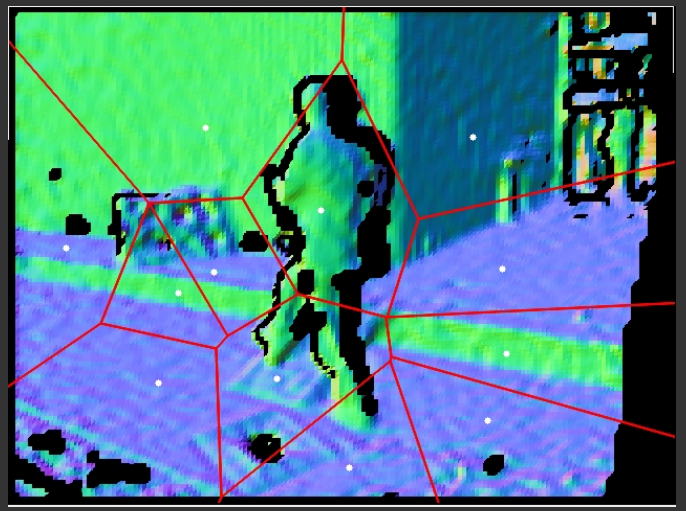
One approach

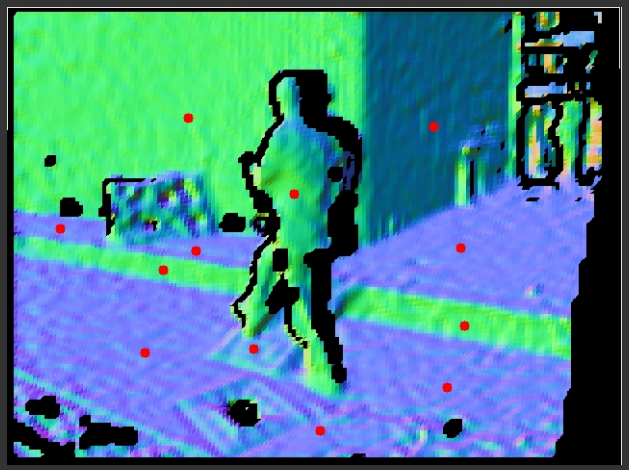
- Recursive color mapping to detect each region
- One random pixel is given, a contour is obtained by color flooding and a new node is created
- The process is repeated for every border pixel
- An edge is created when two regions are neighbors

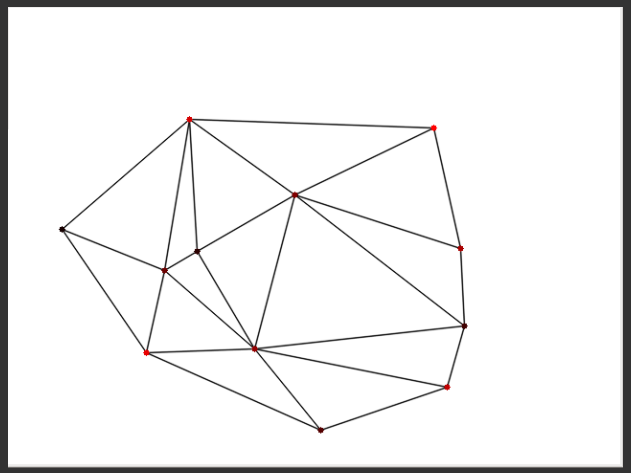
The sequence

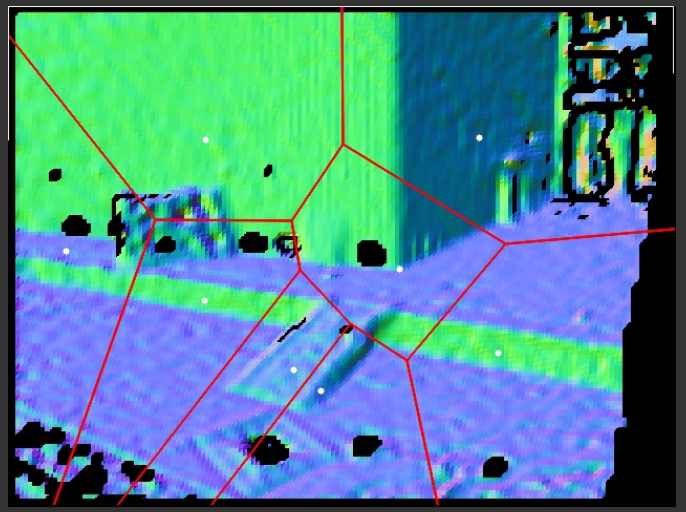










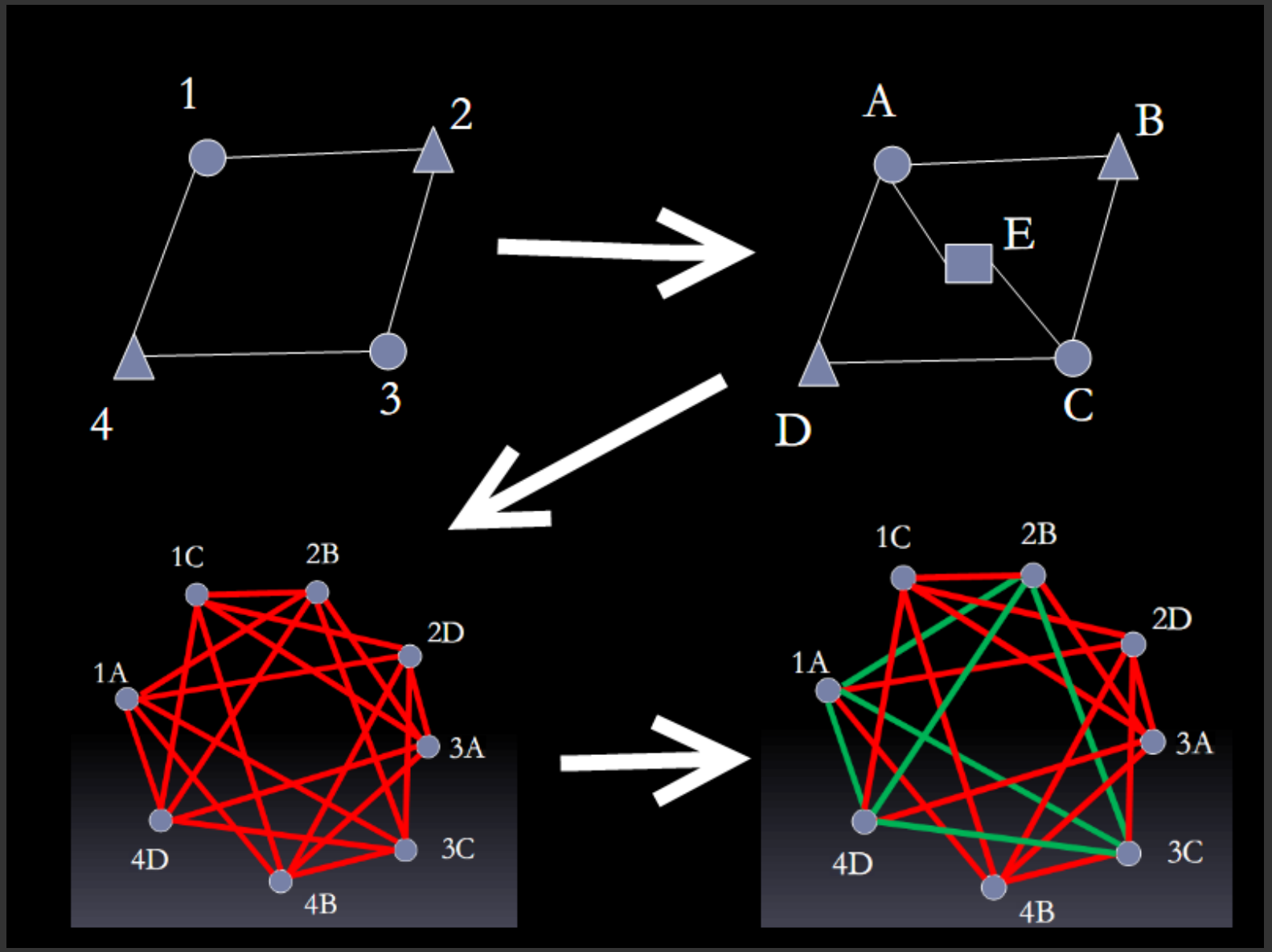


Nodes

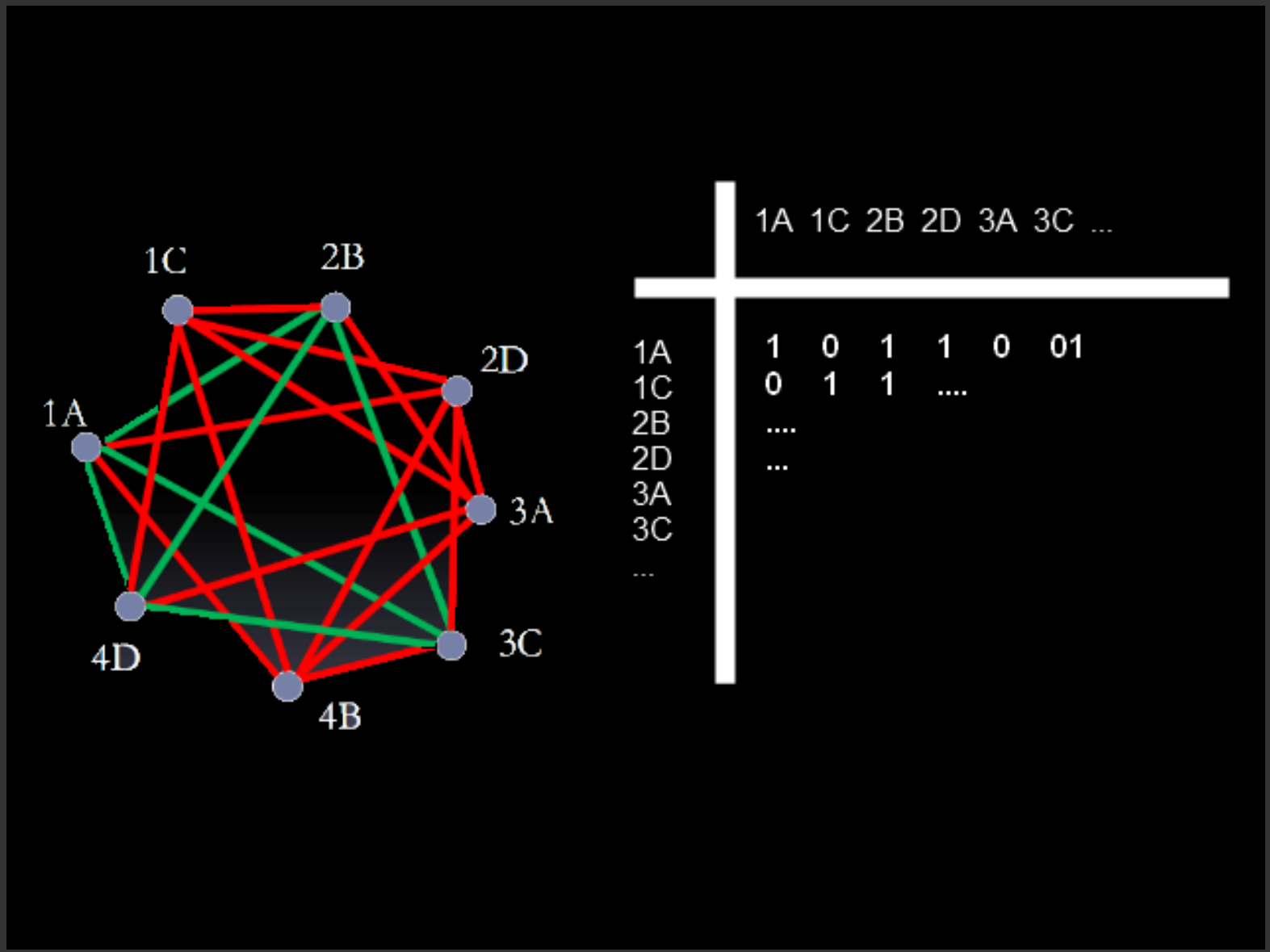
Delaunay

Voronoi

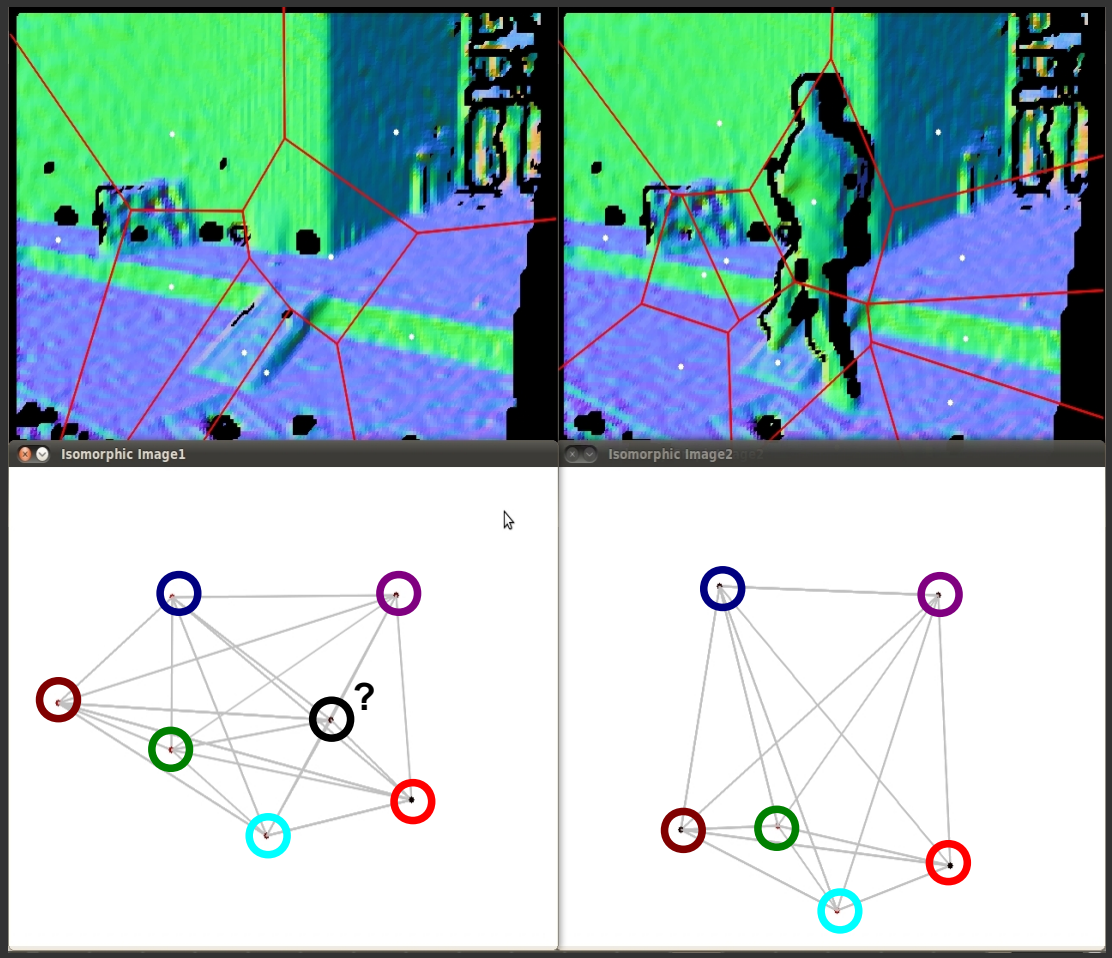
Finding the isomorphisms



Finding the isomorphisms



In the end



- When the largest isomorphic sub-graph is found we can see if the images have matched.
- Then its just looking at the sizes..

Demo-time