CMPS 3130 Computational Geometry – Spring 20

2/6/20

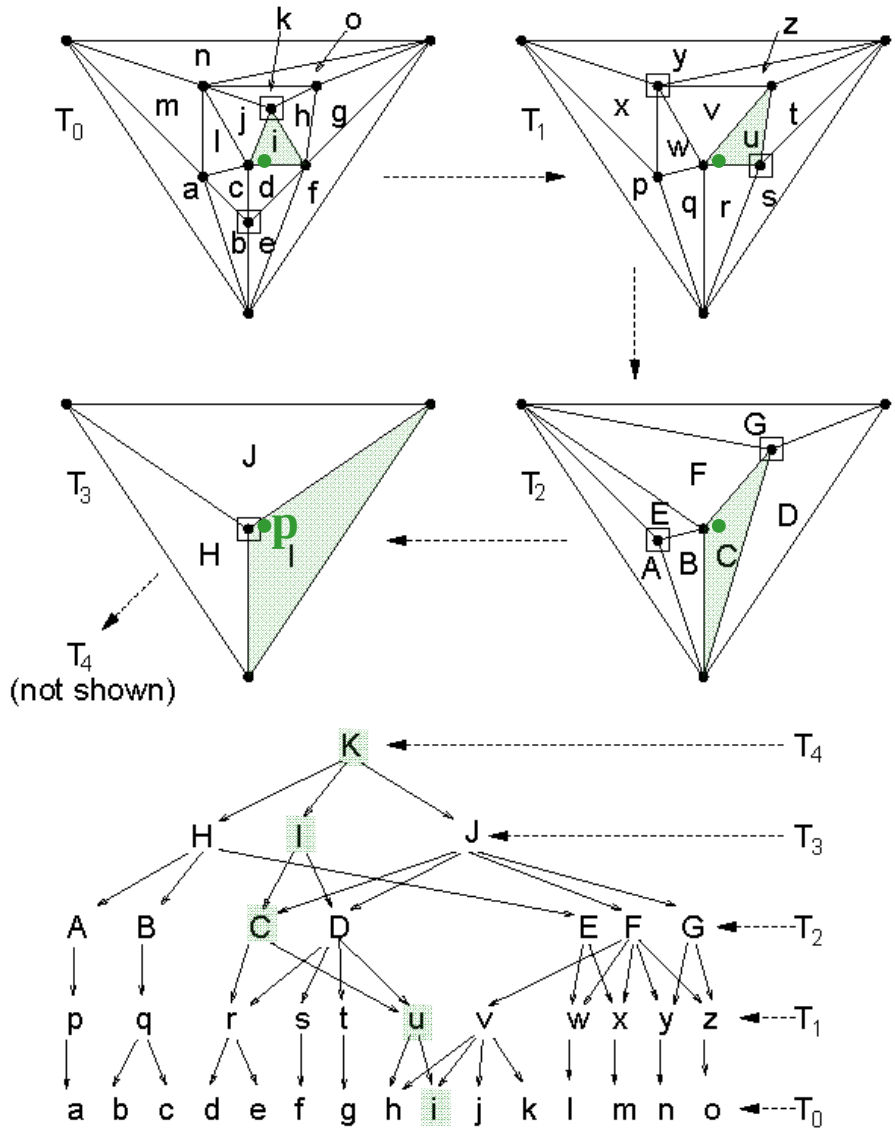
4. Homework (undergrad)

Due **2/13/20** before class

Please justify all your answers. Often it helps to draw pictures.

1. **Kirkpatrick's Hierarchy (5 points)**
   Consider slide 7 of the point location II slides as well as the figure below. The path in the DAG for locating point p is $K - I - C - u - i$. But there are other paths in the hierarchy that also end in triangle i.

   Now consider the path $K-J-F-v-i$. Describe where in the original triangulation a point p' has to lie such that the point location for it would follow this path.



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2. **DCEL (6 points)**

   Which of the following equalities are always true? Justify your answers.

   (a) $Twin(Twin(\vec{e})) = \vec{e}$

   (b) $Next(Prev(\vec{e})) = \vec{e}$

   (c) $Twin(Prev(Twin(\vec{e}))) = Next(\vec{e})$

3. **Adjacent Vertices (10 points)**

   You are given a planar subdivision in a doubly-connected edge list, and a vertex v in this DCEL. Give pseudocode to output all vertices adjacent to v in *clockwise* order. Your algorithm should run in $O(deg(v))$ time, where $deg(v)$ is the degree of v. *(Hint: Draw an example picture and run your algorithm on this example to make sure it works.)*