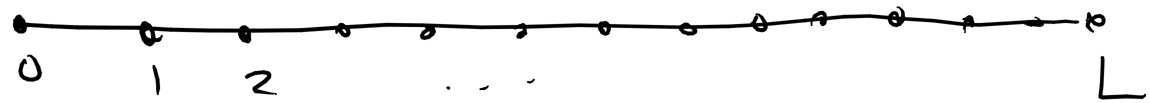
9/10/12

Breaking up a stick



The stick from i to j is worth v_{ij}. How should one cut the stick in order to maximise total value

e.g. cut into $[1,k] + [k,l] + [l,L]$

you get $v_{1,k} + v_{k,l} + v_{l,L}$

DP $\equiv$ sequence of decisions.

After making first decision we should have a smaller problem.

$f(l)$ = maximum obtainable from stick $[0, l]$

$$= \max_{x} \left[f(x) + v_{x,l} \right]$$

$f(0) = 0$

Execution time

$O(L^2)$

Suppose we do not want any piece to be longer that A.

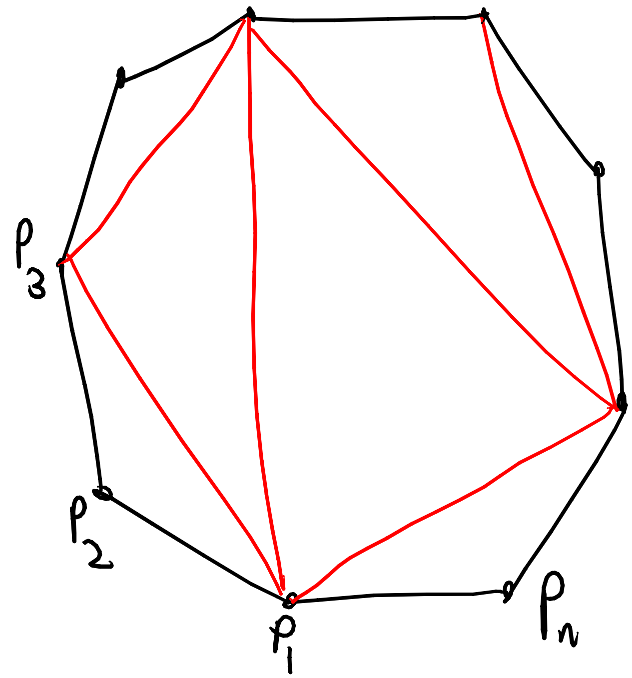
$$f(l) = \max_{l-A \leq x < l} \left[f(x) + v_{x,l} \right]$$

Suppose we do not want there to be more than m pieces in the answer:

$$f(l, p) = \max_{x} \left[f(x, p-1) + v_{x,l} \right]$$

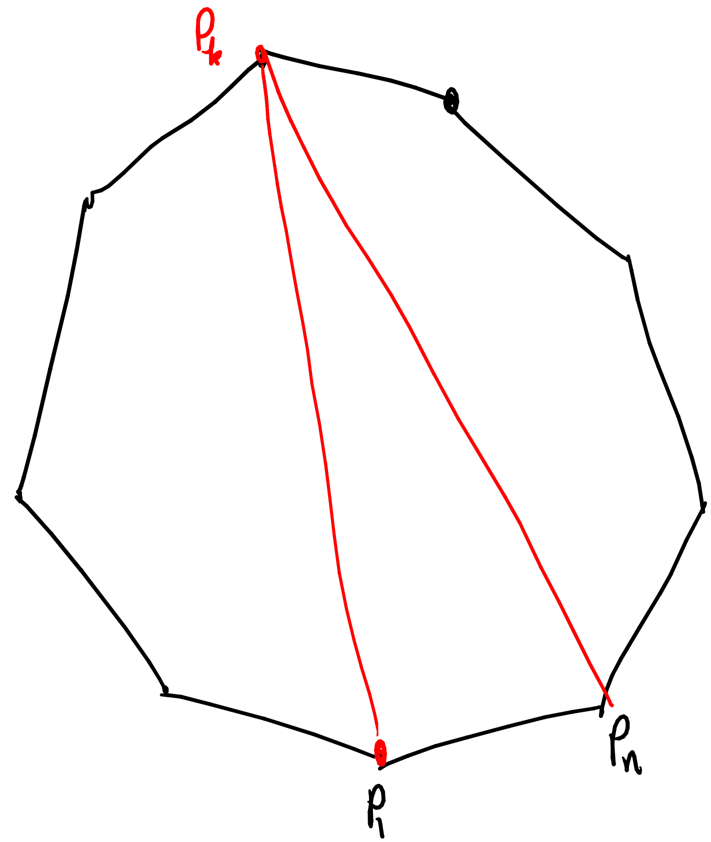
#pieces

$x \geq p-1$ if I want m pieces.



Want to triangulate the polygon

Cost of triangulation is sum of the lengths of the red lines.

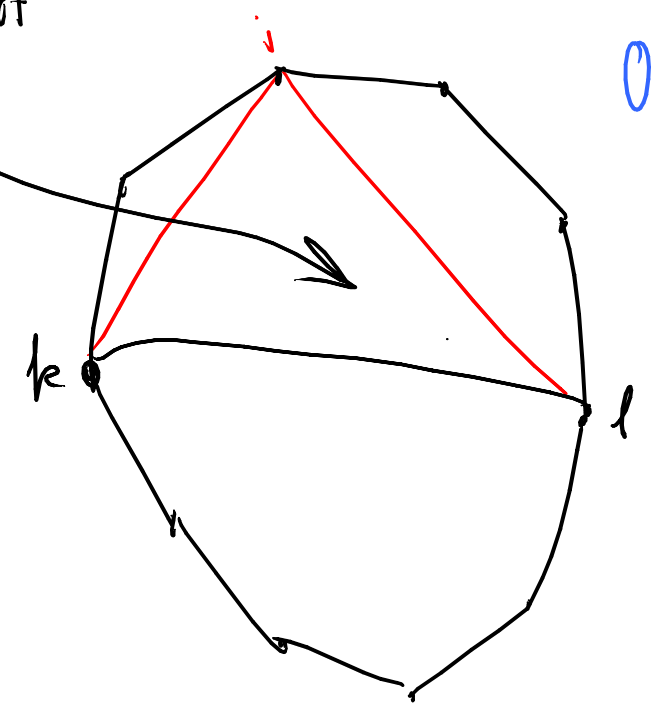


$$f(1,n) = \min_{k} \left[f(1,k) + f(k,n) + |P_1 P_k| + |P_k P_n| \right]$$

$$f(k,l) = \min_{k<j<l} \left[f(k,j) + f(j,l) + |p_k p_j| + |p_j p_l| \right]$$

min cost of

Δing



$O(n^3)$

execution

time.