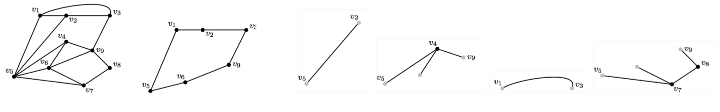
Planarity decision algorithm

Demoucron, Malgrange and Pertuiset (1964)

Start with from a graph G

- Take from a graph G a subgraph H
- H is any cycle from G (so H is planar)
- We iteratively extend H to G
- We determine S, a set of
  - edge not in H but endpoints are in H
  - connected component in G, not in H, with the vertices of attachment
- We select a fragment S_i and a face which can accept S_i



Graph G Subgraph H of G H-fragments

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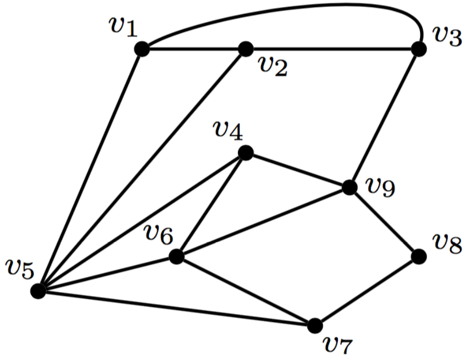
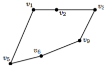
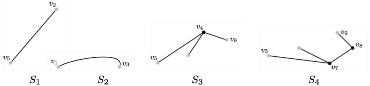
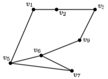
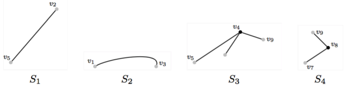
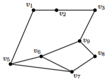
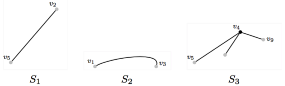
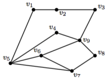
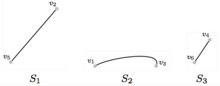
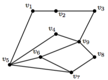
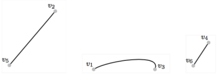
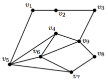
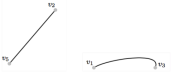
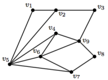
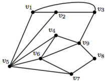
1. Choose a H
2. Compute all faces of H
3. Compute the fragments
4. If there are no fragments, the graph is planar
5. Compute admissible faces for fragments
6. If there is a fragment without an admissible face, the graph is not planar
7. If there is a fragment only one admissible face, embed it, go to 2
8. Chose a fragment and embed it



Graph G

	$F_1 = 1234965$ $F_2 = 1234965$		$F(S_1) = 1,2$ $F(S_2) = 1,2$ $F(S_3) = 1,2$ $F(S_4) = 1,2$
	$F_1 = 123965$ $F_2 = 567$ $F_3 = 1239675$		$F(S_1) = 1,3$ $F(S_2) = 1,3$ $F(S_3) = 1,3$ $F(S_4) = 3$ c
	$F_1 = 123965$ $F_2 = 567$ $F_3 = 6987$ $F_4 = 1239875$		$F(S_1) = 1,4$ $F(S_2) = 1,4$ $F(S_3) = 1$
	$F_1 = 123945$ $F_2 = 567$ $F_3 = 6987$ $F_4 = 5496$ $F_5 = 1239875$		$F(S_1) = 1,5$ $F(S_2) = 1,5$ $F(S_3) = 2$

	$F_1 = 123945$ $F_2 = 567$ $F_3 = 6987$ $F_4 = 5496$ $F_5 = 1239875$	 S_1 S_2 S_3	$F(S_1) = 1,5$ $F(S_2) = 1,5$ $F(S_3) = 2$
	$F_1 = 123945$ $F_2 = 567$ $F_3 = 6987$ $F_4 = 465$ $F_5 = 496$ $F_6 = 1239875$	 S_1 S_2	$F(S_1) = 1,6$ $F(S_2) = 1,6$
	$F_1 = 125$ $F_2 = 23945$ $F_3 = 567$ $F_4 = 6987$ $F_5 = 465$ $F_6 = 496$ $F_7 = 1239875$	 S_1	$F(S_1) = 7$
	$F_1 = 125$ $F_2 = 23945$ $F_3 = 567$ $F_4 = 6987$ $F_5 = 465$ $F_6 = 496$ $F_7 = 123$ $F_8 = 139875$		