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July 24, 2020

# Gain graphs and motions

In the extended abstract
http://fwcg14.cse.uconn.edu/program/wp-content/uploads/sites/863/2014/10/fwcg2014_submission_12.pdf
we propose to use gain graphs geometrically. Given a periodic framework with an infinitesimal motion, we want to show that we can "shrink" the gains so that the infinitesimal motion is preserved. It may happen, that shortening one gain forces some other gain to increase in order to preserve a motion.

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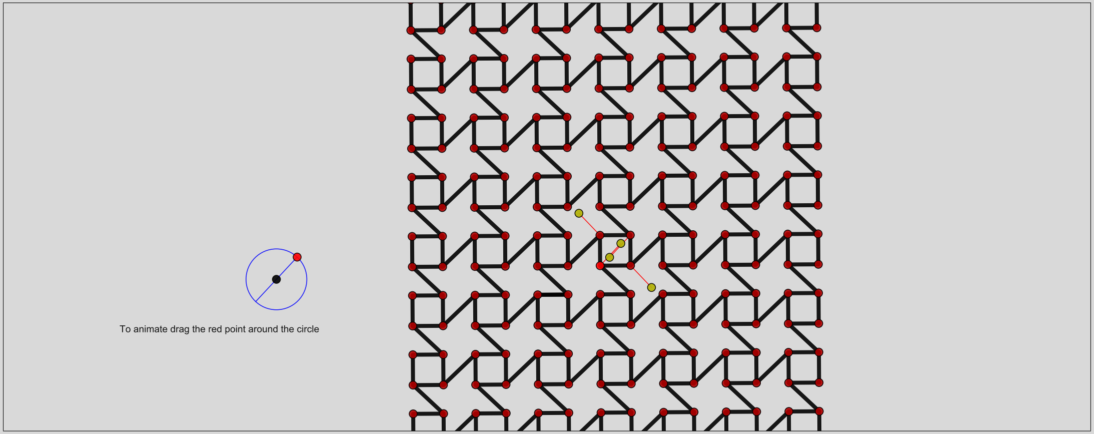
# Gain graphs and motions



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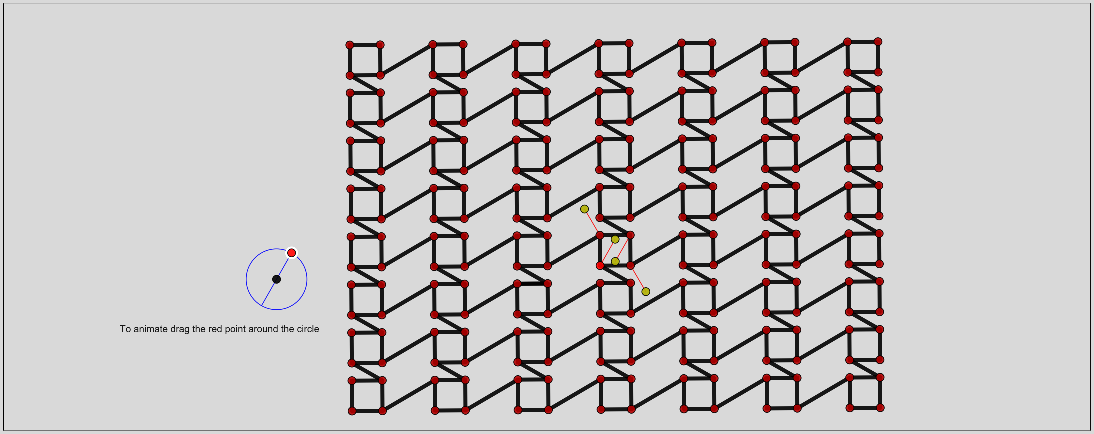

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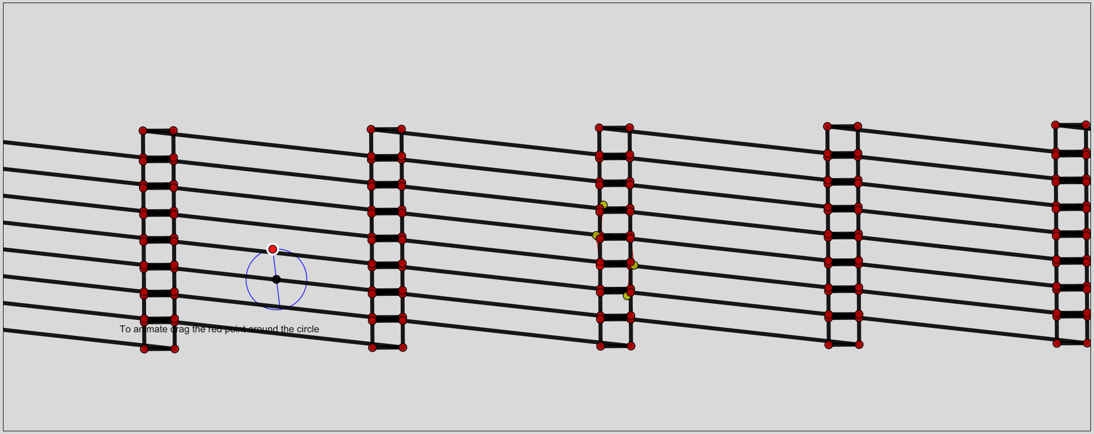

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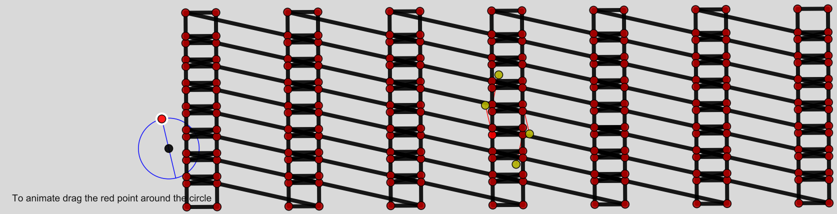

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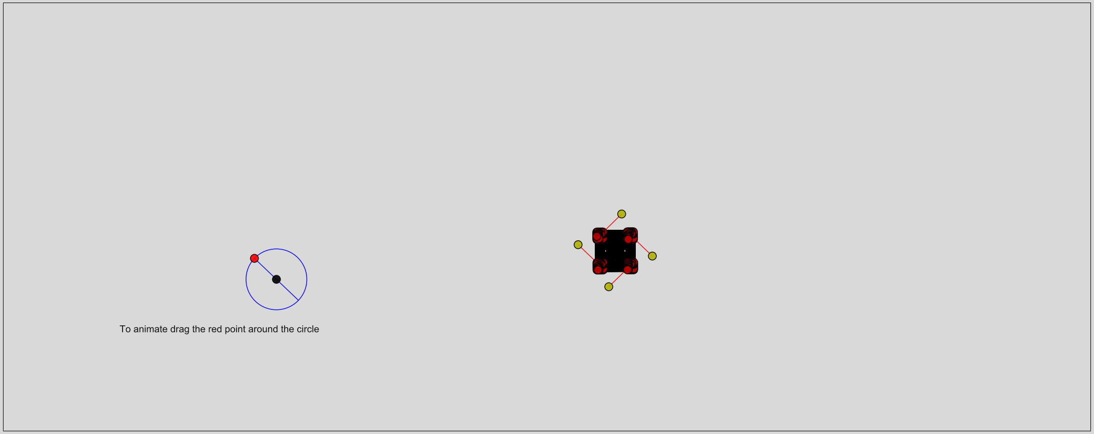

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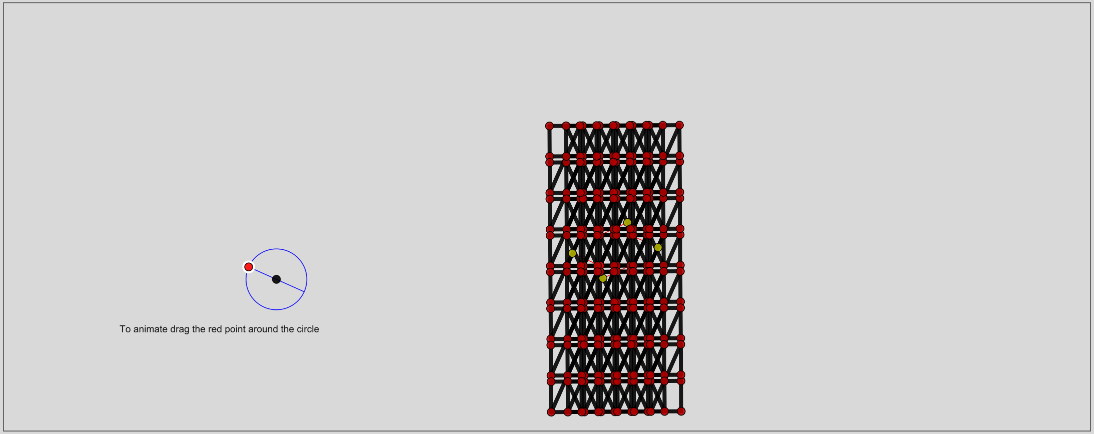

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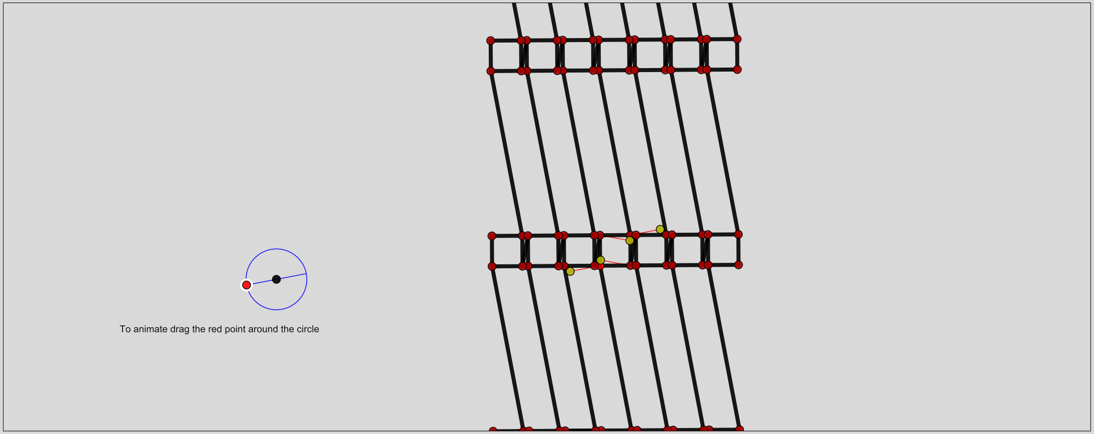


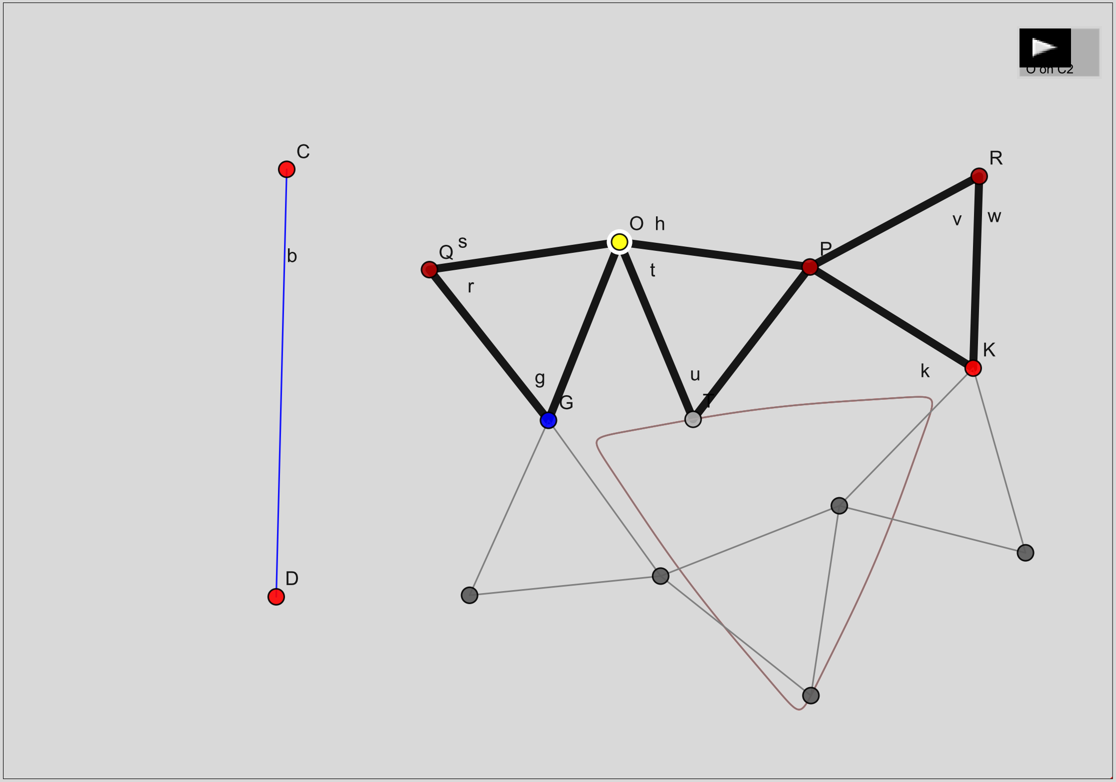
# Gain graphs and motions

The more important question is: Which infinitesimal motions of the gain graph lift to infinitesimal motions of the periodic framework.

# Unit distance realizations of combinatorial zeolites

Assume you have n fixed points in the plane contained in the interior of a disc of radius 1. It is trivial to construct a 2n-gon with unit distance edge lengths such that every other point on the 2n-gon is one of the given fixed points and all new points are within the given disc. This pinned 2n-gon is a pinned isostatic framework and we consider the 2n-gon as a body-pin graph. Vertices correspond to rigid bodies, which we want to be triangles and edges correspond to pins. Releasing a pin lets the two released triangles move in a circle about the fixed points and we clearly can insert a new equilateral triangle. The free nose of this new triangle describes a coupler curve which is quite complicated and has one or two components depending on the distance between the fixed points. We want to show that repeating this process of releasing pins and inserting triangles that the coupler curves do not get small in the sense that they should contain two points unit distance apart, and that all these coupler curves intersect.

# Unit distance realizations of combinatorial zeolites



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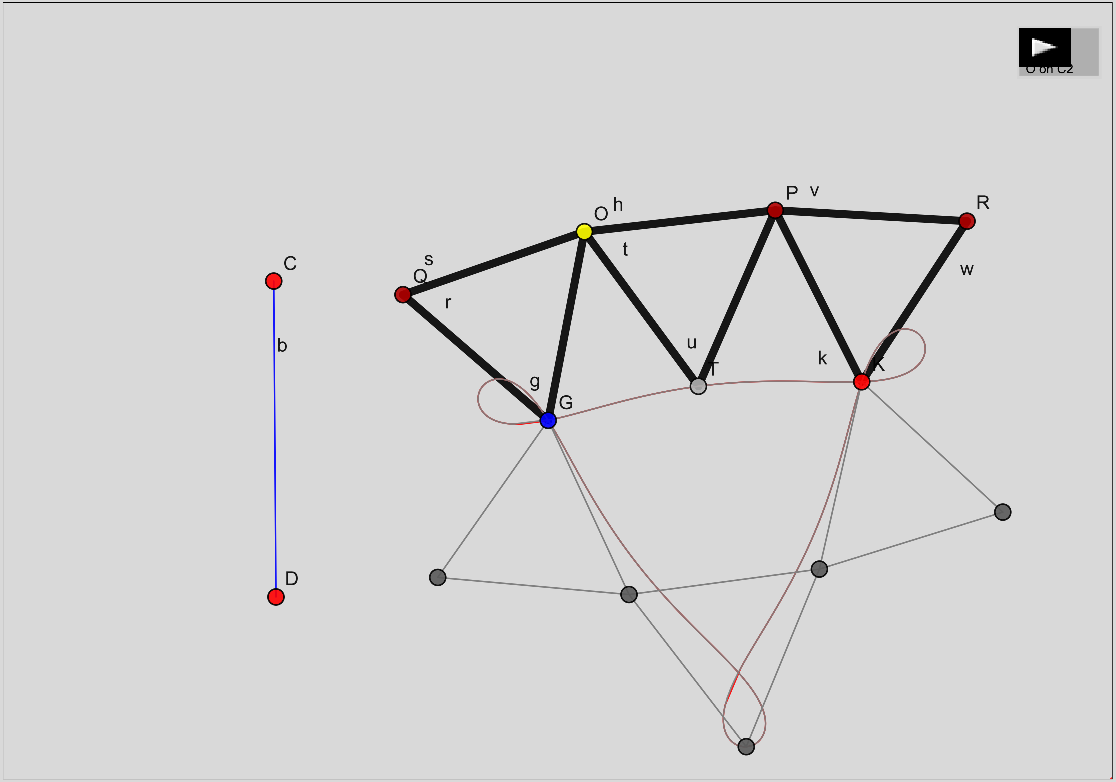

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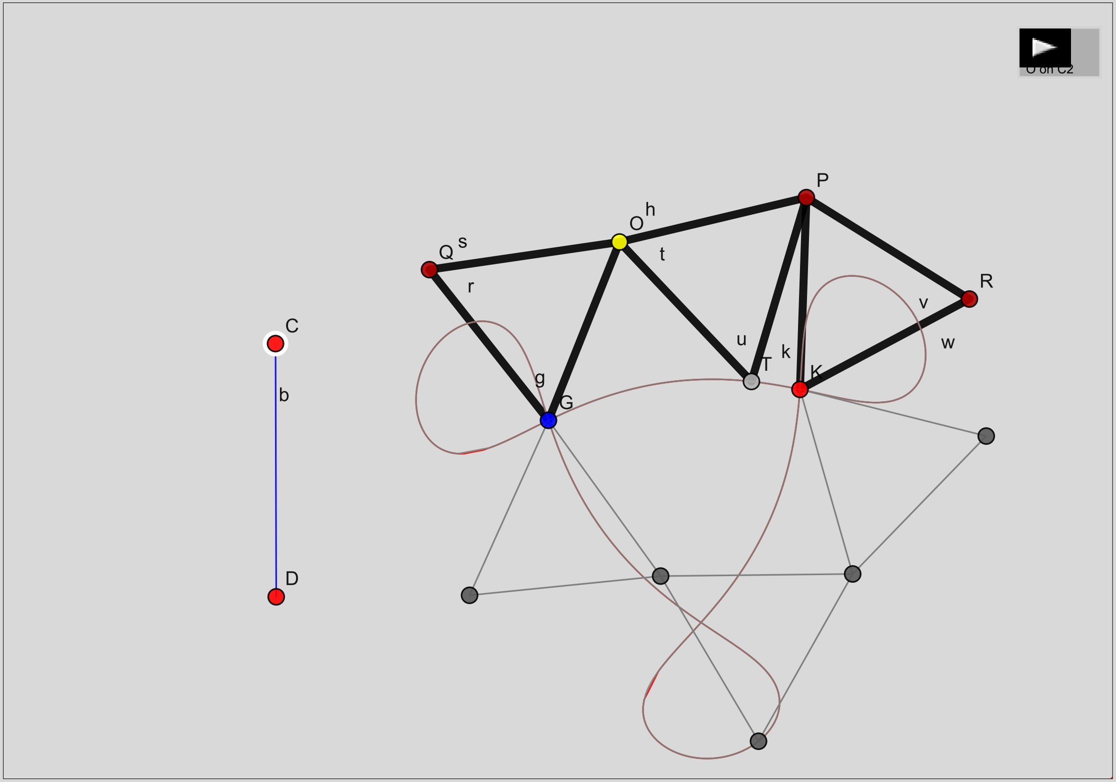



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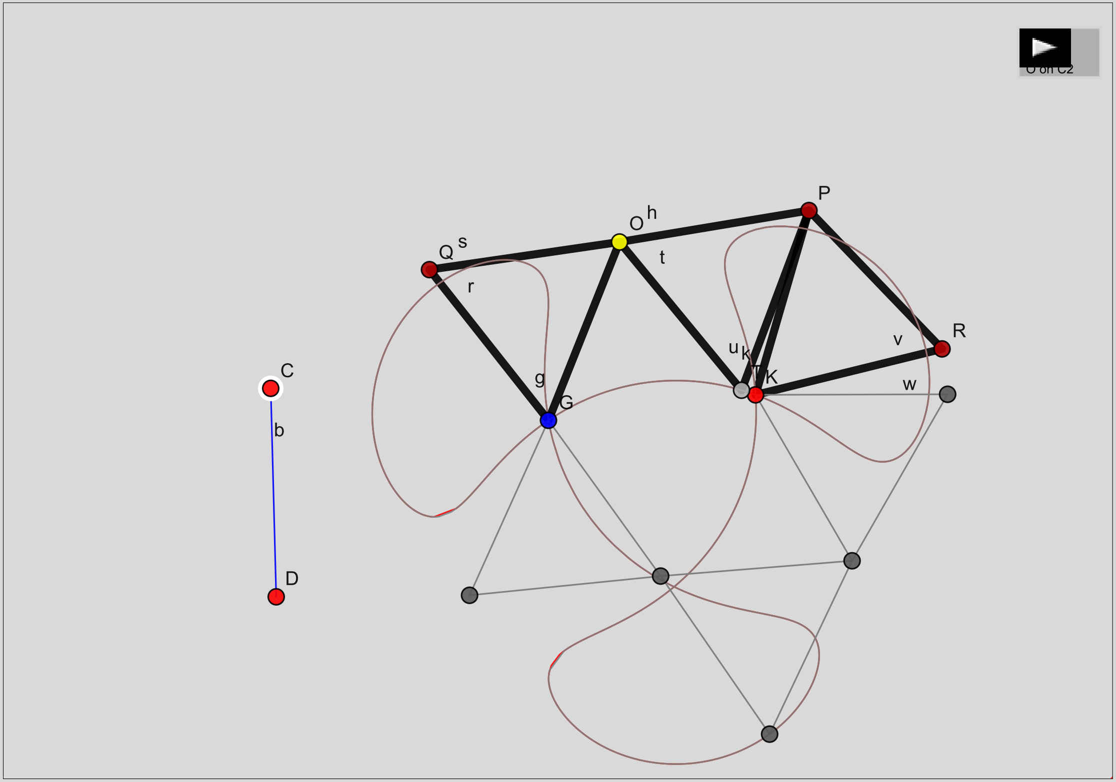

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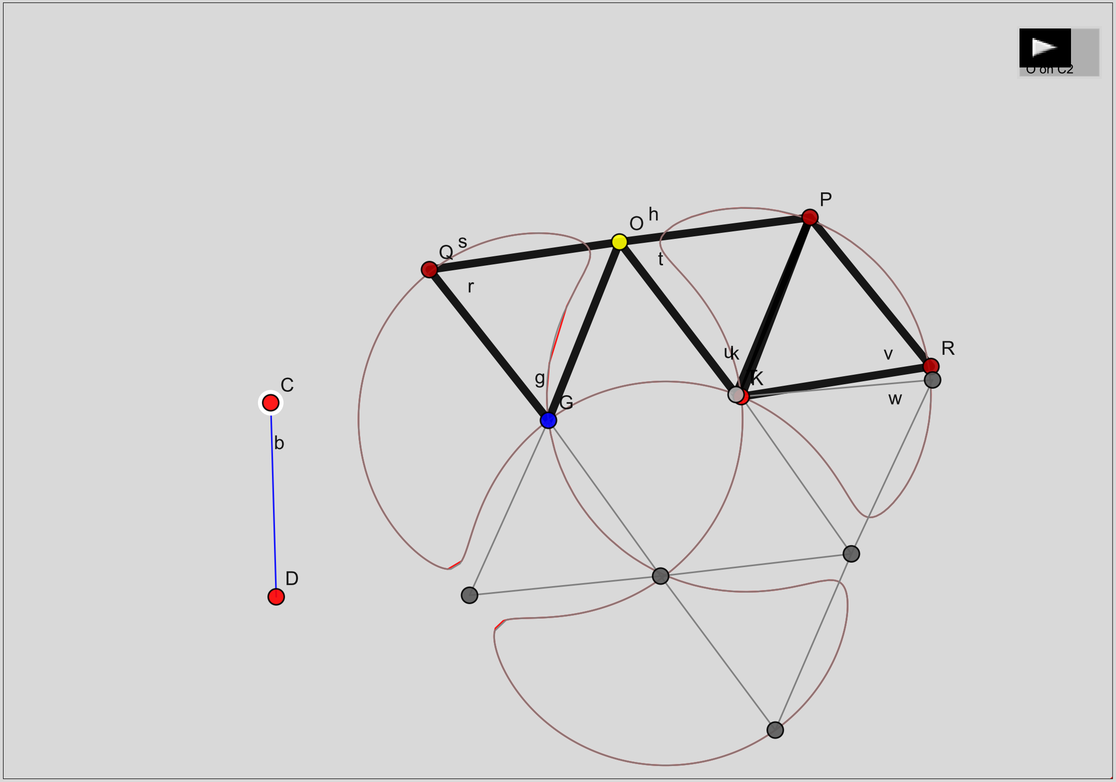

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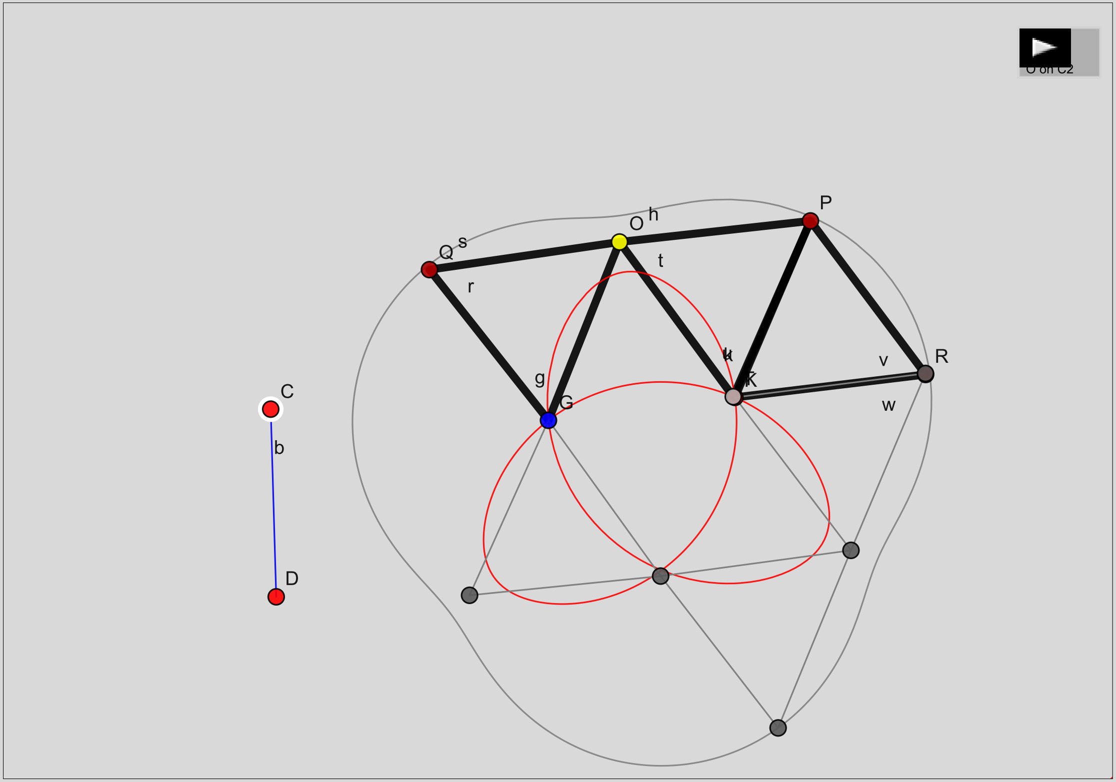

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