The Road Best Traveled

The Mathematics of Getting There and Back Again

Houghton Math and Science Day

Houghton College, Houghton, NY

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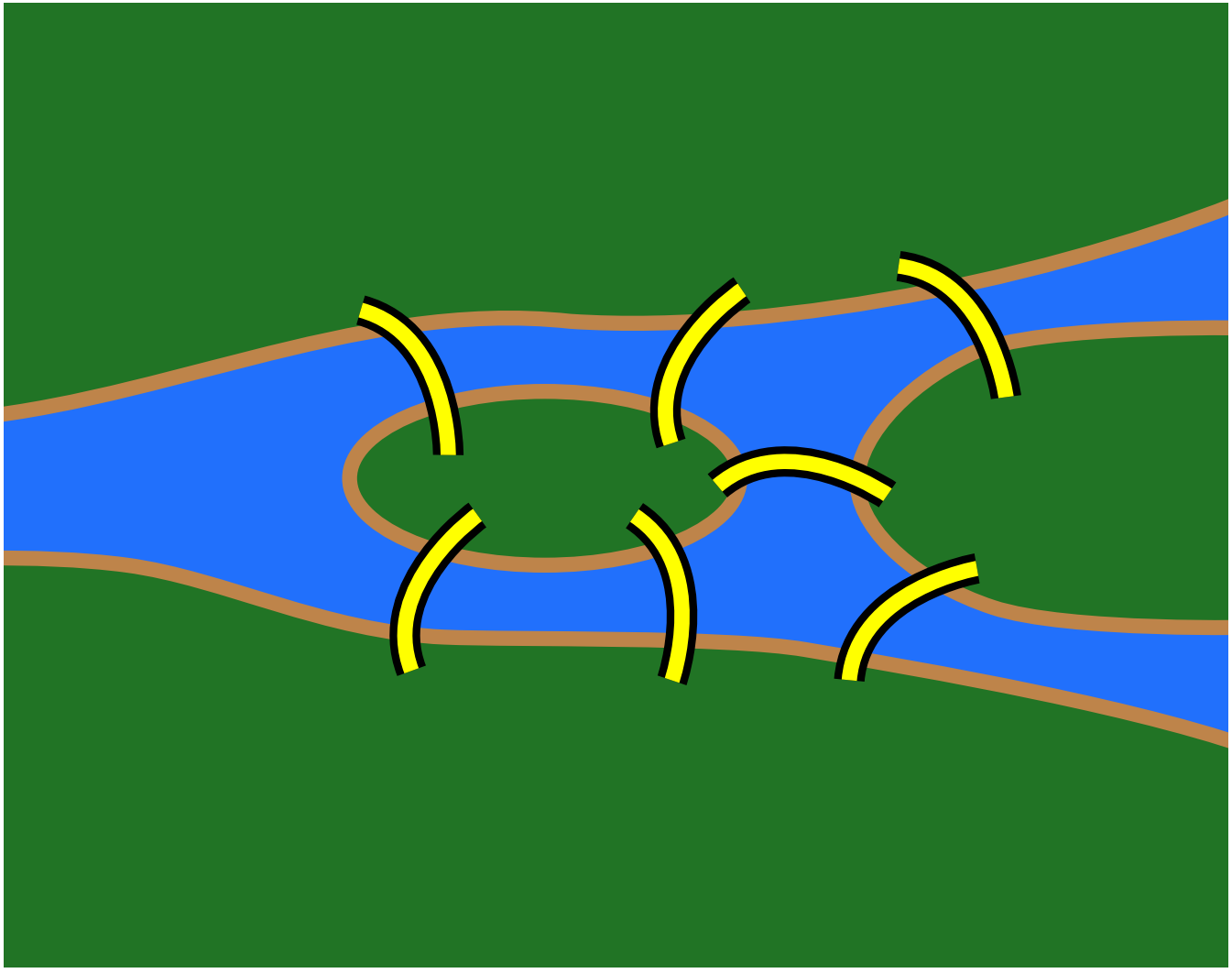
The Bridges of Königsberg



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Enter Euler

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Traveling Salesperson Problem

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Traveling Salesperson Problem

The Nearest Neighbor Algorithm:

- Start at home base.
- Go to the nearest city.
- From there, go to the nearest city you haven't already been to.
- Continue until you have visited every city.
- Go home.

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The Sorted Edges Algorithm

- Label the edges from shortest to longest using the labels $e_1, e_2, e_3, \ldots$.
- Include e_1 and e_2 in your cycle.
- Starting with e_3, add each next edge to your cycle if it
  1. does not make three edges you've chosen meet at a vertex AND
  2. does not close up a circular route that doesn't include all the vertices in the graph.
- If a subsequent edge doesn't meet these two criteria, discard it and move on to the next edge in your list.
- You're done when you have a Hamiltonian cycle.

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Not Really an Algorithm

Brute Force

- Determine every possible Hamiltonian cycle in the graph.
- Find the total weight of each Hamiltonian cycle.
- Choose the cycle with the smallest weight.

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