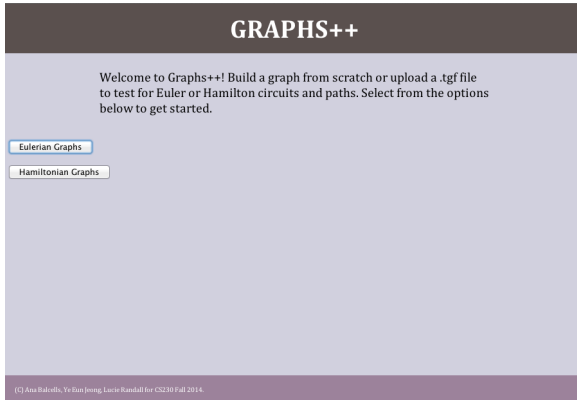# Graphs++ User Manual

- A graph theory program for finding Eulerian and Hamiltonian circuits and paths -

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A. Specify Graph Type

From the home page, begin by choosing the type of graph with which you want to work.

B. Input A Graph

You can then create a graph from scratch (B1) or by uploading an existing graph from a TGF file (B2).

When your graph is complete, click either the 'Find Circuit' or 'Find Path' button to specify a calculation type.

➔ *You must specify an input method. Your selection (highlighted) will determine which graph is used for calculations.*

B1. Create Graph from Scratch

1) Add one or more nodes by typing their names in the space provided and clicking the 'Add' button.
2) Create edges between node by choosing two from the drop down menus and clicking the second 'Add' button.

➔ *Nodes names must be unique and an edge cannot be created connecting a node to itself.*

B2. Create Graph from TGF File

1) Upload an existing graph by typing its file name and path in the space provided.
2) Make sure the file name ends with ".tgf". Other file types will not be accepted.
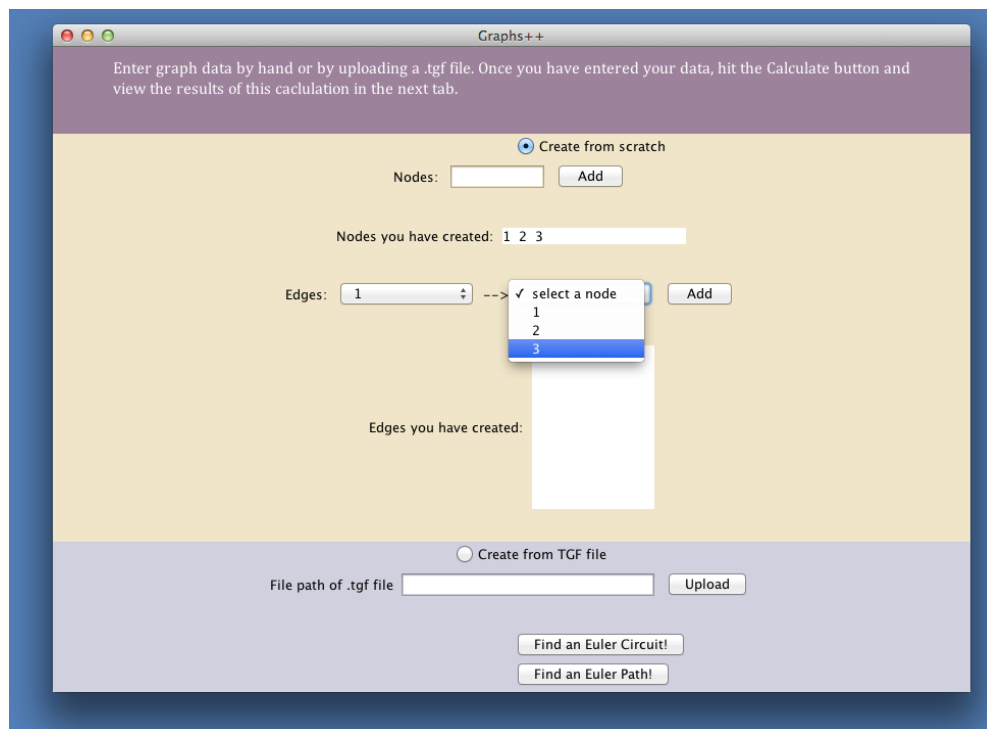3) Click the 'Upload' button.

C. Results

This page displays the result of your calculation, an explanation of the findings, and the node circuit sequence if there is one.

Return to the home page to work with another graph type by clicking the button at the bottom of the window.

D. GUI demo

Click on the top radio button, "Create from scratch," and start adding nodes one by one. When a node is created, they are added to the combo boxes from which you can make selections of nodes to create edges between them. The edges created will be shown in the box below.
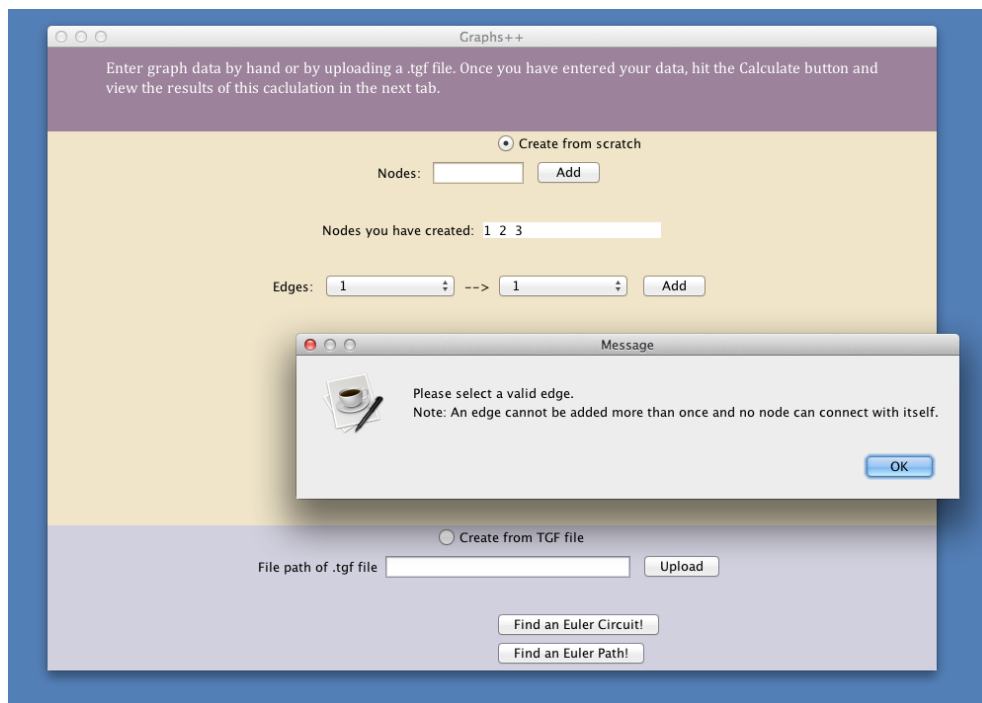
When creating edges, the user must select two different, valid nodes. Otherwise, there will be an error message.

The edges created between two valid vertices will be displayed in the box below the combo boxes as the user clicks "Add." The order of vertices does not matter, since the graphs will be undirected.
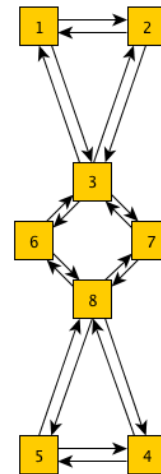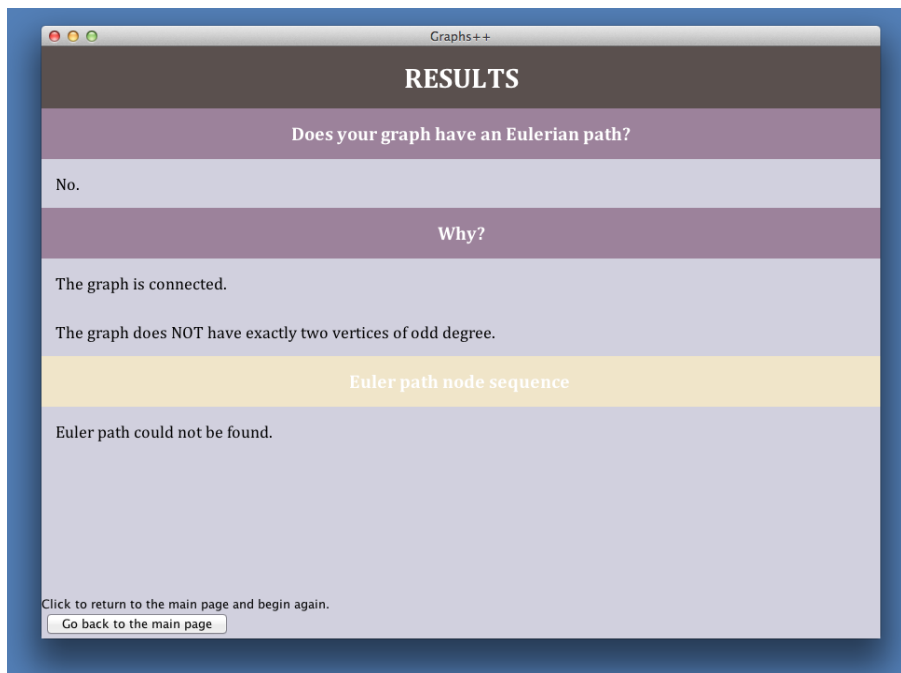

Alternatively, click on the bottom radio button, "Create from TGF file," to upload a ready-made graph to the program.
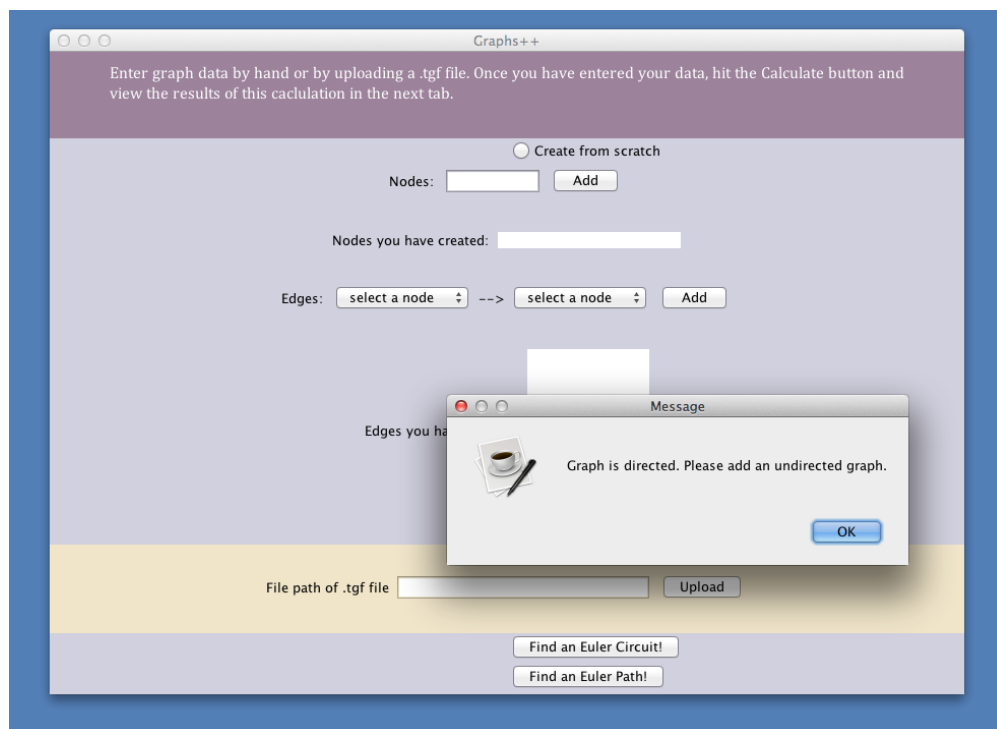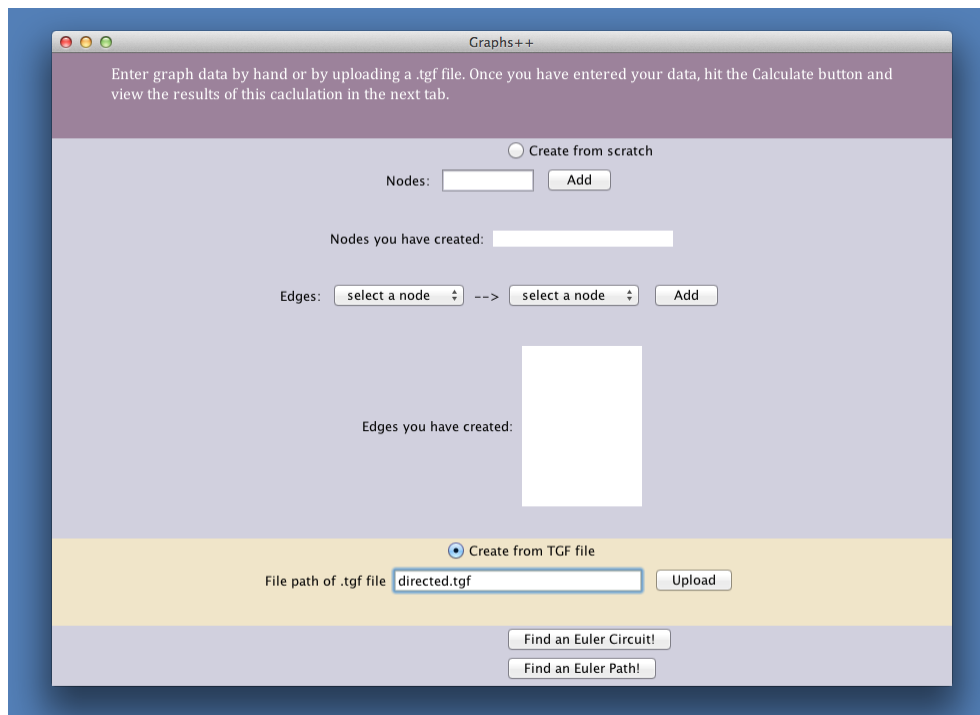
If you create a directed graph on yEd and try to upload it, it will refresh the file upload display and prompt you to add an undirected graph.

After a TGF file has been successfully uploaded, the user can click on either option to find a path or a circuit in the graph.

An Euler circuit test on this graph gives back a positive result, and the panel tells you why. The sequence of nodes that make up the circuit is displayed.
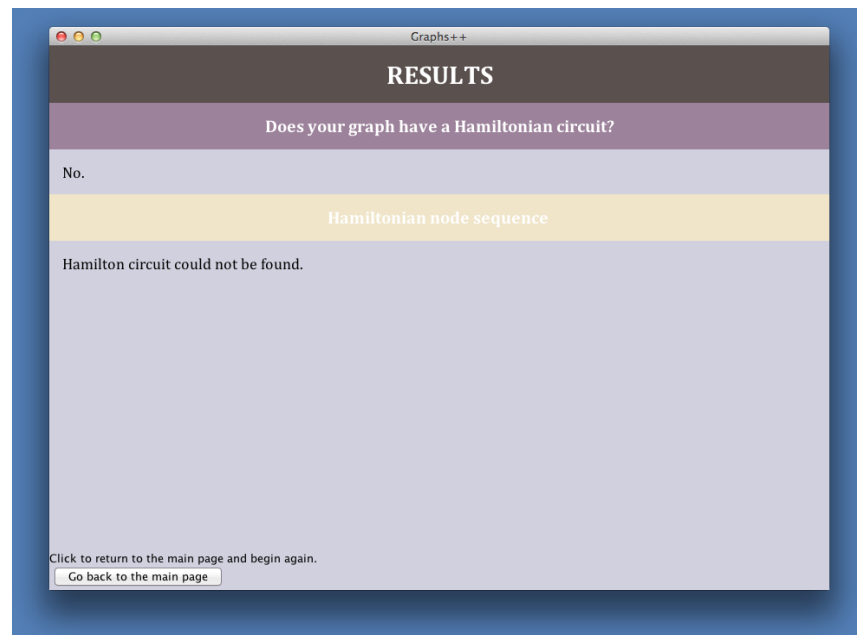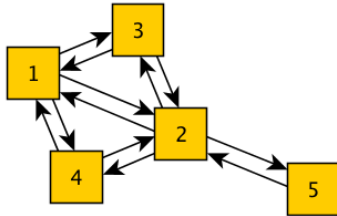
The same graph tested for an Euler path tests negative, because the graph has a circuit, not a path. The graph does not have exactly two vertices of odd degree.
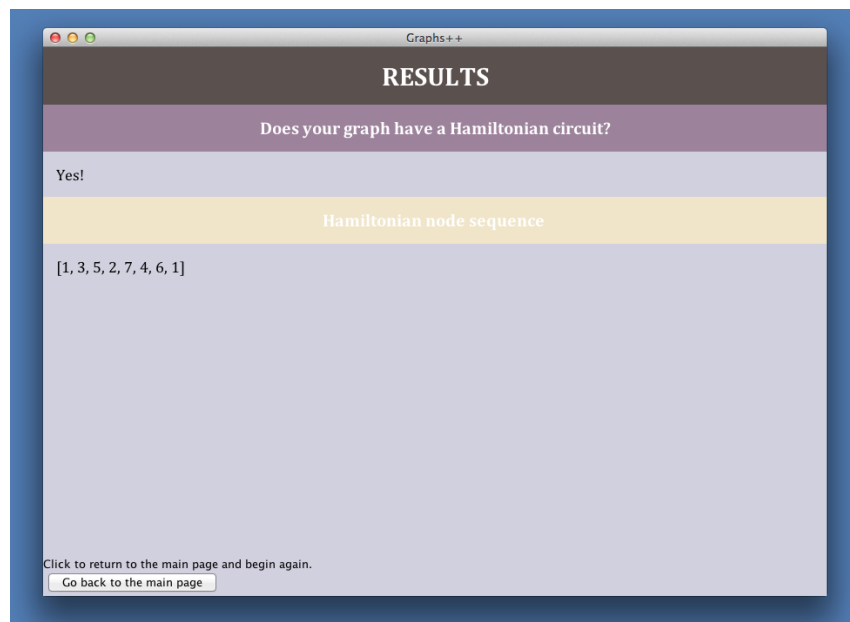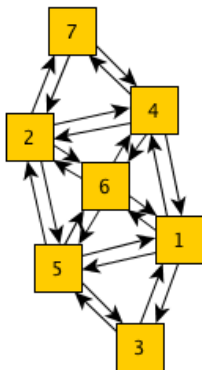
This graph tested for a Hamiltonian circuit tests positive, and the resulting node sequence for a circuit is displayed.

This graph, which obviously cannot have a Hamiltonian circuit because of a "bridge" at node 5, tests negative for a Hamiltonian circuit.
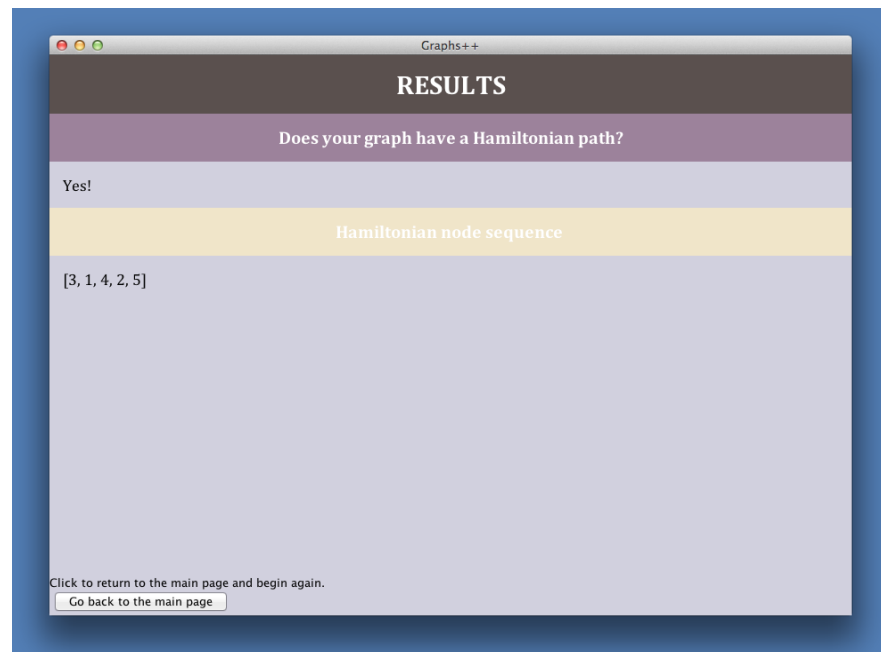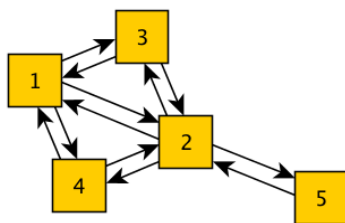
However, the same graph tests positive for a Hamiltonian path, and the corresponding node sequence for such a path is displayed.