

Fontys Hogescholen

Algorithms 2

Assignment 1

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1. Explanation

Main code (GUI)

We decided to use a python library named PySimpleGUI for the GUI of the assignment.

To be able to run the application, please run:

```
pip3 install pysimplegui  
sudo apt-get install python3-tk
```

First we start with the GUI generation. We declare all the components that we are going to use and the actual window of the application.

After that we have an event loop with all the event of the application :

- We have the *generate* event which is activated if the user clicks on the generate button. This event is responsible for the adjacency matrix, dot file generation and the visualization of the graph itself.
- Next we have the *connect* event which is responsible for converting the disconnected graph into a connected one and then display the new graph.
- The *Vertex cover* button takes an int from the vertex cover text box and attempts to make a vertex cover with the said number of vertices. If that is possible, it highlights the vertices in the cover red, if it is not, it displays an error message in red.

Connect graph code:

We implemented a DFS algorithm starting from vertex 0. after we have traversed all the nodes that are connected to 0 we check if the number of visited vertices is the same as the number of all the vertices of the graph and if that is not the case we locate a vertex which is not connected to the traversed graph the connect that vertex to the last visited vertex. Then we continue with the DFS and check again if the number of visited nodes is the same as the number of vertices in the graph.

Generate dot file code:

This function is really straightforward: we go through the adjacency matrix and generate the dot file base on it. We write everything as a string and then we use the *file.write()* to put the generated string into a file.

Generating a dot file for a graph where the program is asked to create a vertex cover

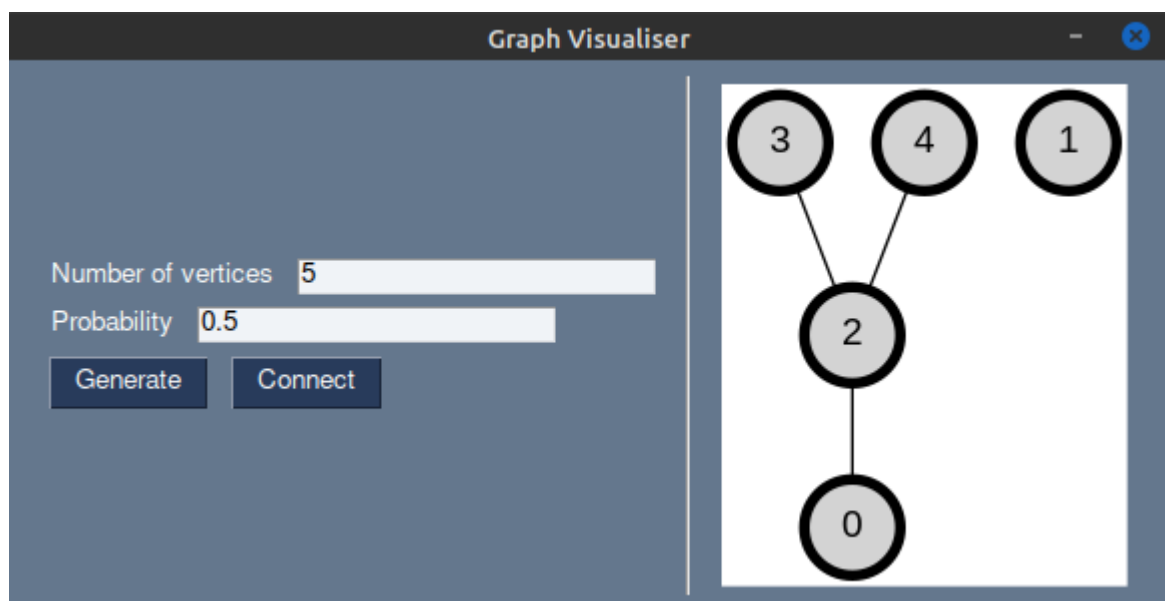
(when pressing the Vertex cover button) is done in a similar fashion, however the function takes a cover as an argument and highlights the nodes that are contained in the cover in red.

2. Testing

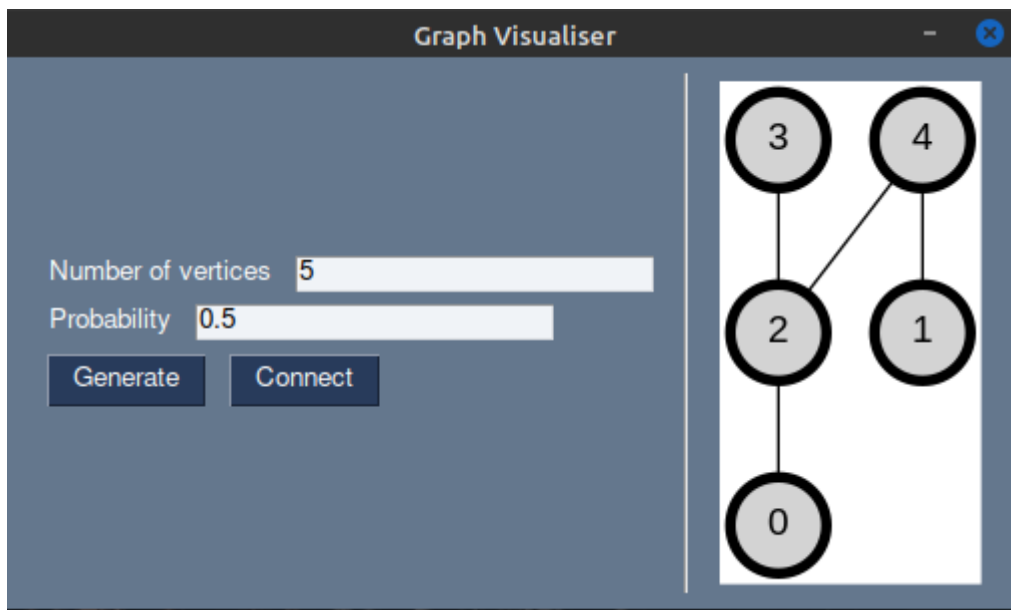
We decided to manually test our solution so we did an extensive testing on our solution with different numbers of vertices and probability for the edges. We covered all the features of the program and tested every edge case.

3. Result

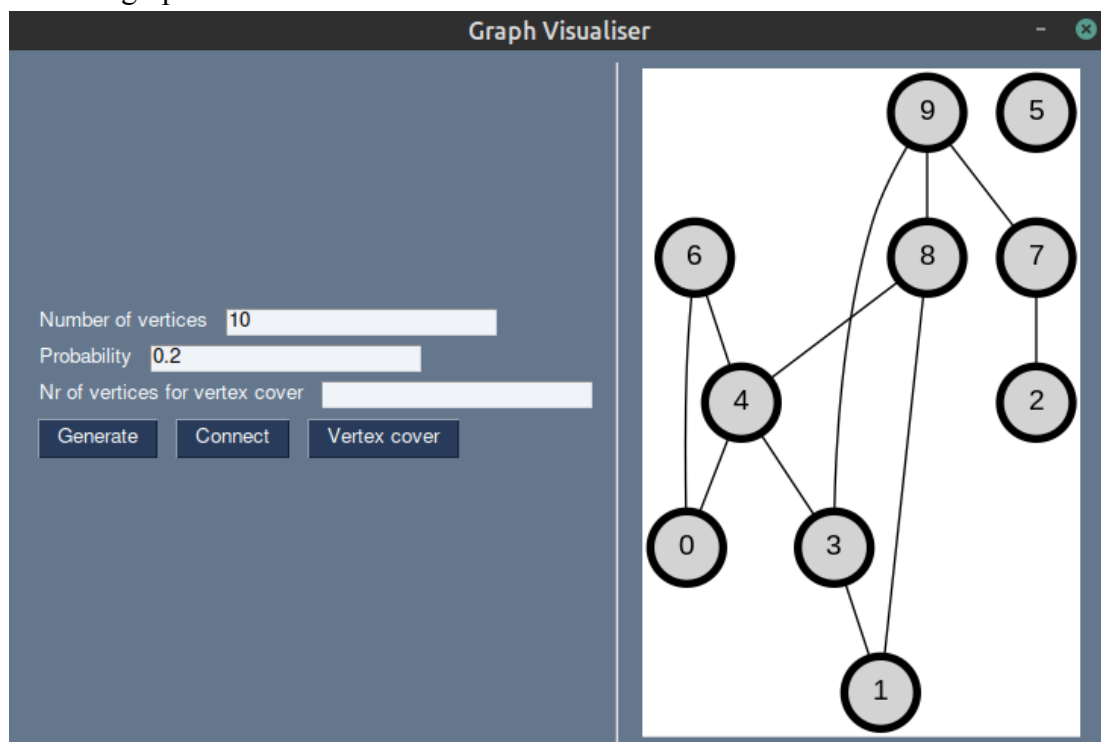
before clicking *Connect*



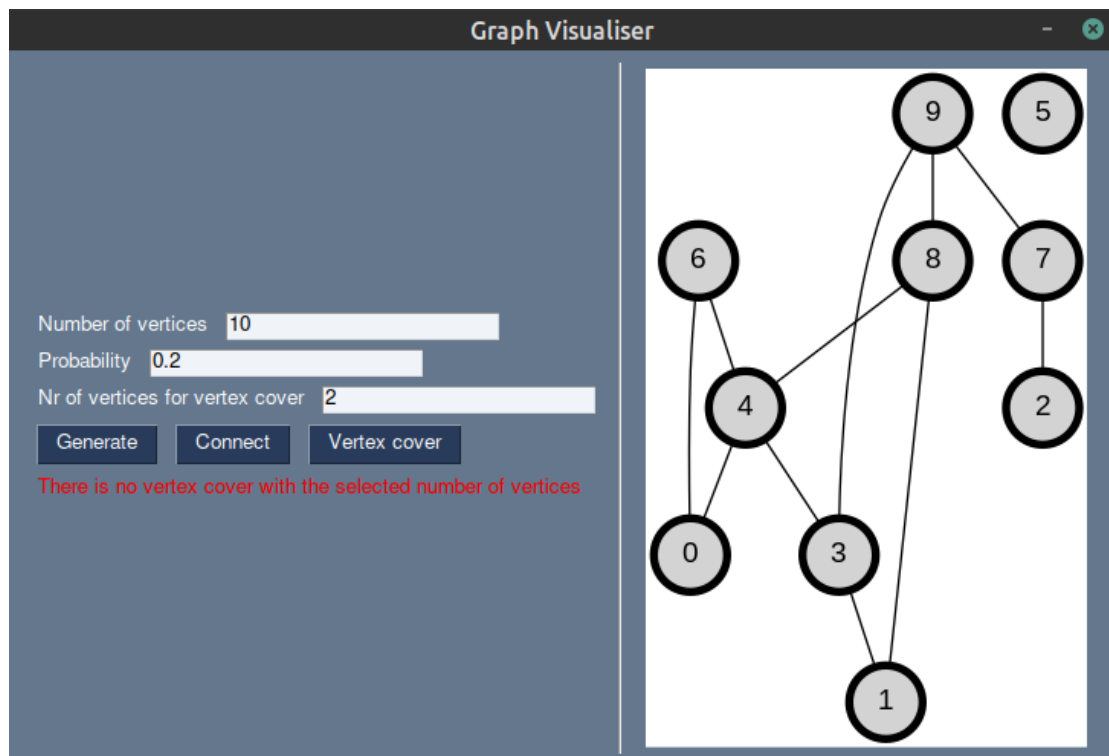
after *Connect*



This is a graph with 10 vertices.



We then ask the program to make a vertex cover with 2 vertices, which is impossible.



However, with 5 vertices it is, and it shows us the valid cover.

