

CSE 512 LABORATORY – Week 3, Winter 2012

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In this lab, we will be implementing a basic version of **graph search**. We will then implement plain **depth-first search** and **breadth-first search** on top of graph search – this will be easy!

Start out with a simple example graph to search. Once you have running code, you may want to extend this graph into a more complex one.

```
# example graph: the key of each pair is a node ("state"), the value are this
# nodes children (immediate "successors")
```

```
Graph = {'a':['b','c'], 'b':['d'], 'c':['j'], 'd':['e','f'],
        'j':['d'],'f':['g'], 'e':[], 'g':[]}
```

Graph search will need a function that will determine whether a state meets the goal criteria. There also needs to be a function that provides the list of successors of a given state. Let these functions be the following:

```
def goal_test(state):
    return state == 'g'
```

```
def successor_fct(state):
    return Graph[state]
```

Complete function `graph_search` according to the algorithm we studied in class (also see textbook):

```
def graph_search(initstate, openlst):
    ...
    ...
```

Once implemented, you can write a depth-first search function like this:

```
def dfs_graph_search(initstate):
    return graph_search(initstate, Stack())
```

Data structures `Stack` and `FIFOQueue` can be found in file `~voigt/cse512/datastructs.py`

What will the breadth-first function look like? Implement this function as well. Test your depth-first and breadth-first search by running

```
>>> depth_first_search('a')
```

```
>>> breadth_first_search('a')
```

Both functions should take you from starting state 'a' to goal state 'g'. Try the same with a more complex graph.

If there is time left: The basic implementation of graph search reaches a goal state, but it does not provide the **path** (= sequence of states) that lead from the initial state to the goal. Modify your function `graph_search` so that upon reaching the goal, the path is returned. Test.

For Lab Credit: Demonstrate your work to your instructor, and sign the **signup sheet**.