Universidade do Minho
Escola de Engenharia
Departamento de Informática

Uninformed search in Graphs

Mestrado Integrado em Engenharia Informática
Licenciatura em Engenharia Informática
Inteligência Artificial

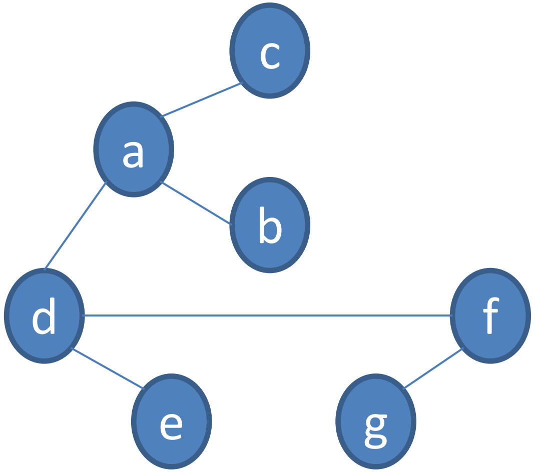
Summary

- Uninformed search in Graphs;
  - DFS (Depth First Search);
  - BFS (Breadth first Search);
- Using Graphs to solve problems.

DFS (Depth First Search)

- DFS (Depth First Search):
  - Go as deep as possible;
  - Backtrack and try new paths (in depth);
  - Simple data structures: a visited node list, an actual path (or use a Stack);
  - Does not retrieve an optimal path first (not guarantee the best solution).

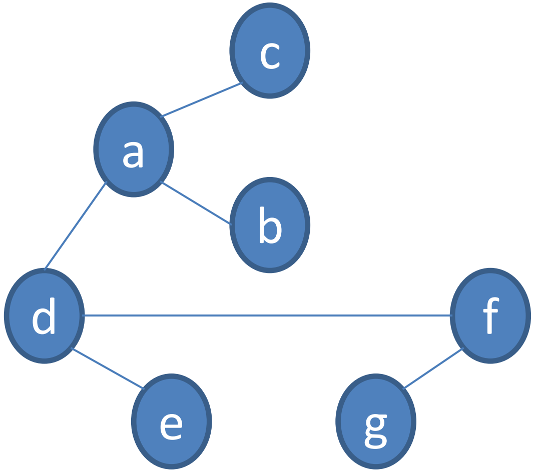
Graph example



```
edge(a,b).
edge(a,d).
edge(a,c).
edge(d,e).
edge(d,f).
edge(f,g).

connect(X,Y):- edge(X,Y).
connect(X,Y):- edge(Y,X).
```

DFS (Depth First Search)



From node a:

- Visit d, then e, no more nodes….
- Backtrack to d, visit f, visit g, no more nodes…
- Backtrack f, no more nodes….
- Backtrack d, backtrack a, visit b no more nodes…
- Backtrack to a visit c, done.

- a→d→e→f→g→b→c.

DFS (Depth First Search)

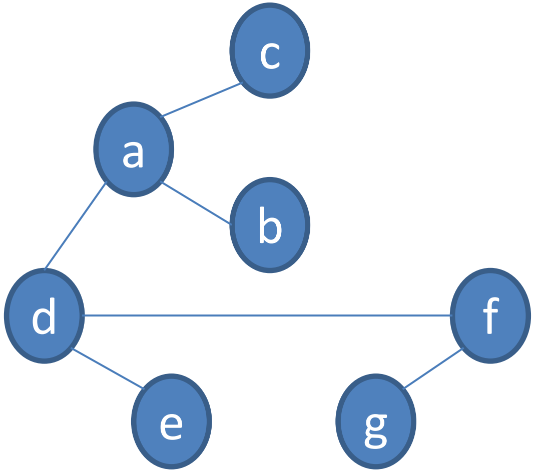
- dfs(Orig,Dest,Cam):- dfs2(Orig,Dest,[Orig],Cam). %condicao final: nó actual = destino
- dfs2(Dest,Dest,LA,Cam):- reverse(LA,Cam). %caminho actual esta invertido
- dfs2(Act,Dest,LA,Cam):- connect(Act,X), %testar ligacao entre ponto actual e um qualquer X

  \+ member(X,LA), %testar nao circularidade p/evitar nós ja visitados
- dfs2(X,Dest,[X|LA],Cam). %chamada recursiva

BFS (Breadth First Search)

- BFS (Breath First Search):
  - Explore all adjacent nodes;
  - Then explore all nodes accessible from the previous ones…repeat;
  - Heavy data structure required: need to store all unexpanded paths… (Queue needed…);
  - Does retrieve optimal (minimal) solution first.

Graph example



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edge(a,b).
edge(a,d).
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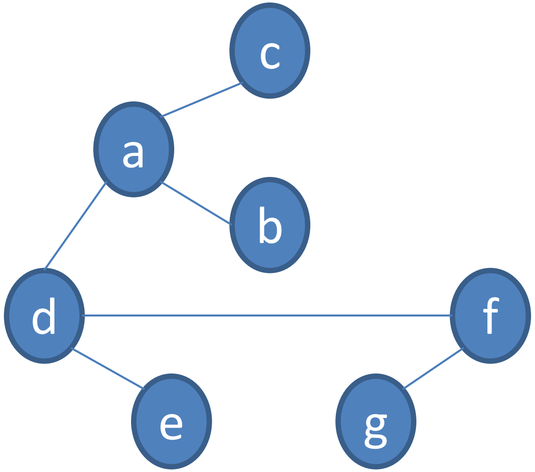
BFS (Breadth First Search)



From node a:

- Visit d, then b, then c;
- Visit e then f;
- Visit g. done.

- a→d→b→c→e→f→g.

BFS (Breadth First Search)

```
bfs(Orig, Dest, Cam):- bfs2(Dest,[[Orig]],Cam).

bfs2(Dest,[[Dest|T]|_],Cam):- reverse([Dest|T],Cam). %o caminho aparece pela ordem inversa
bfs2(Dest,[LA|Outros],Cam):- LA=[Act|_],
                             findall([X|LA],
                  (Dest\==Act,connect(Act,X),\+member(X,LA)),Novos),
                             append(Outros,Novos,Todos),
                             bfs2(Dest,Todos,Cam).
```

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