18.11 Depth first search using time stamps

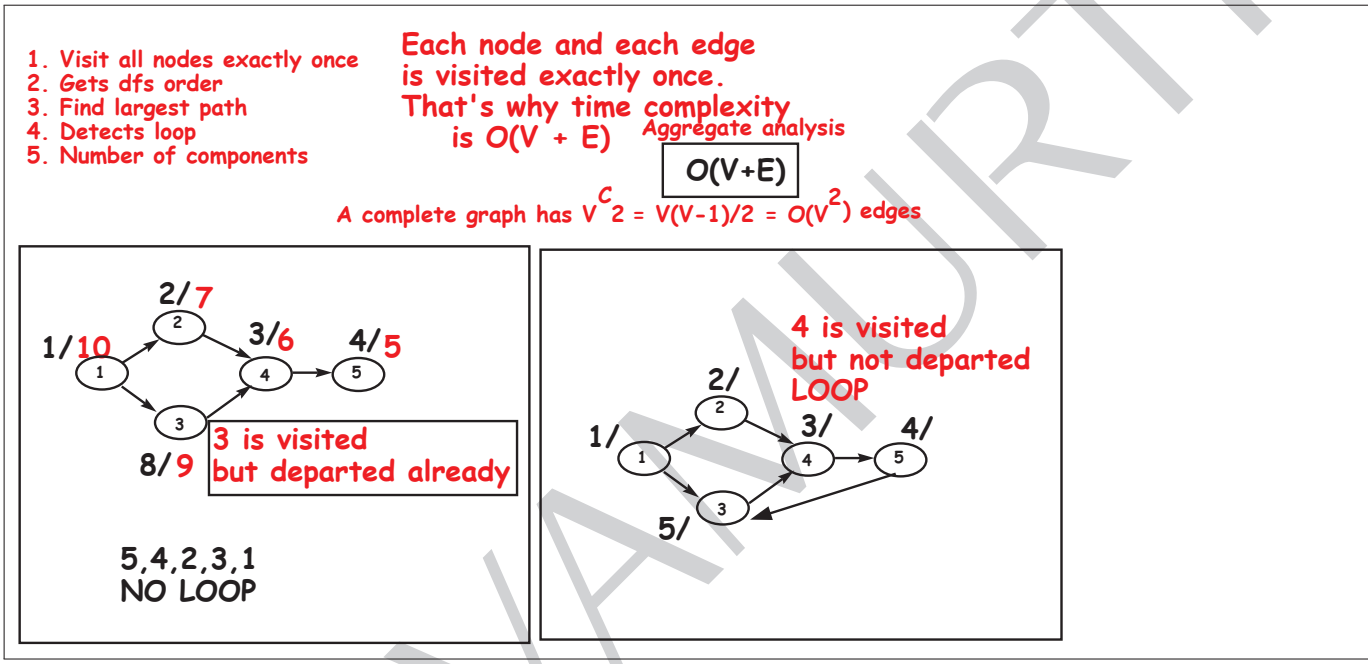

Figure 18.32: Depth first search on a directed graph using time stamps

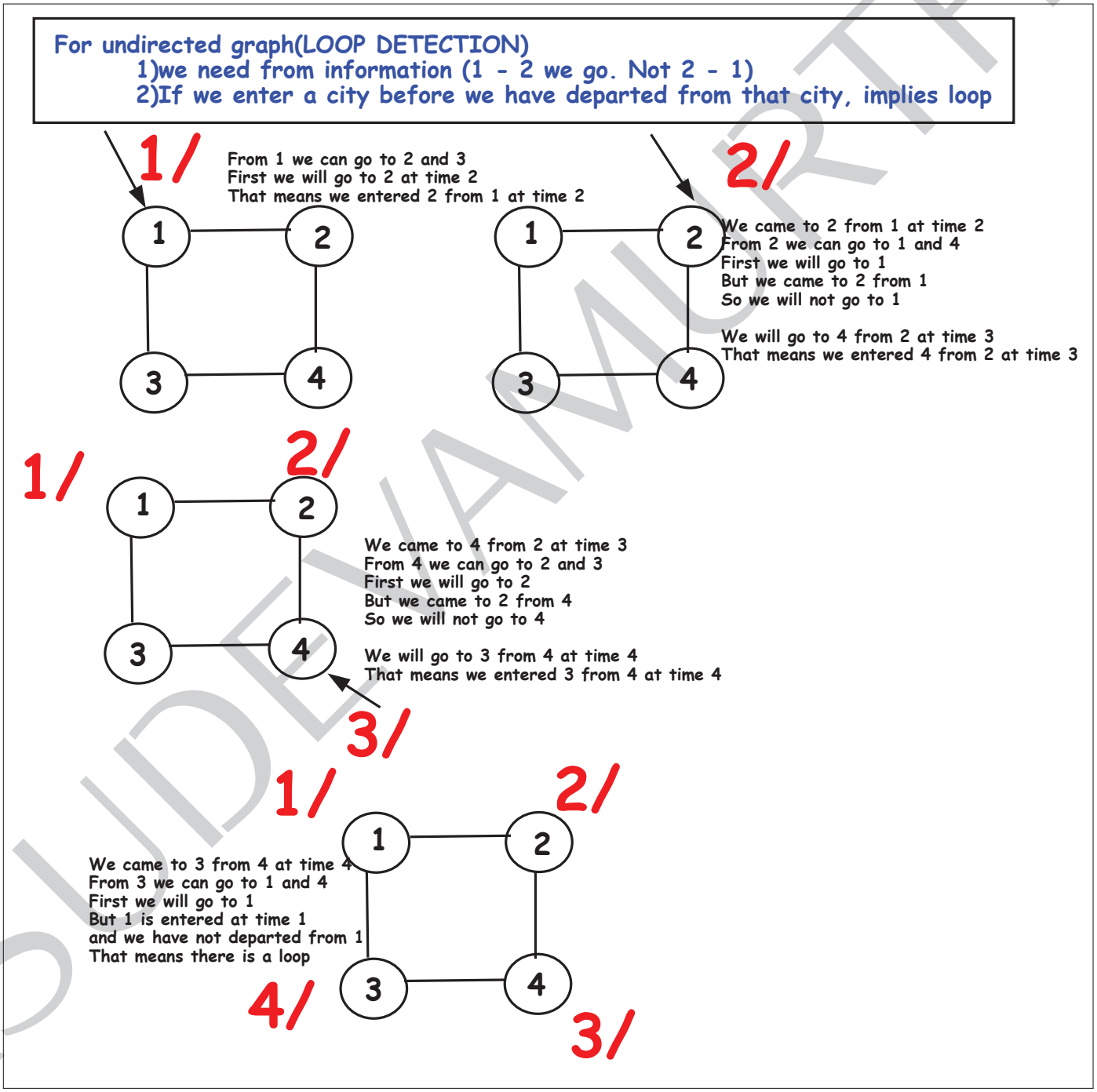

Figure 18.33: Depth first search on an undirected graph using time stamps and **from**

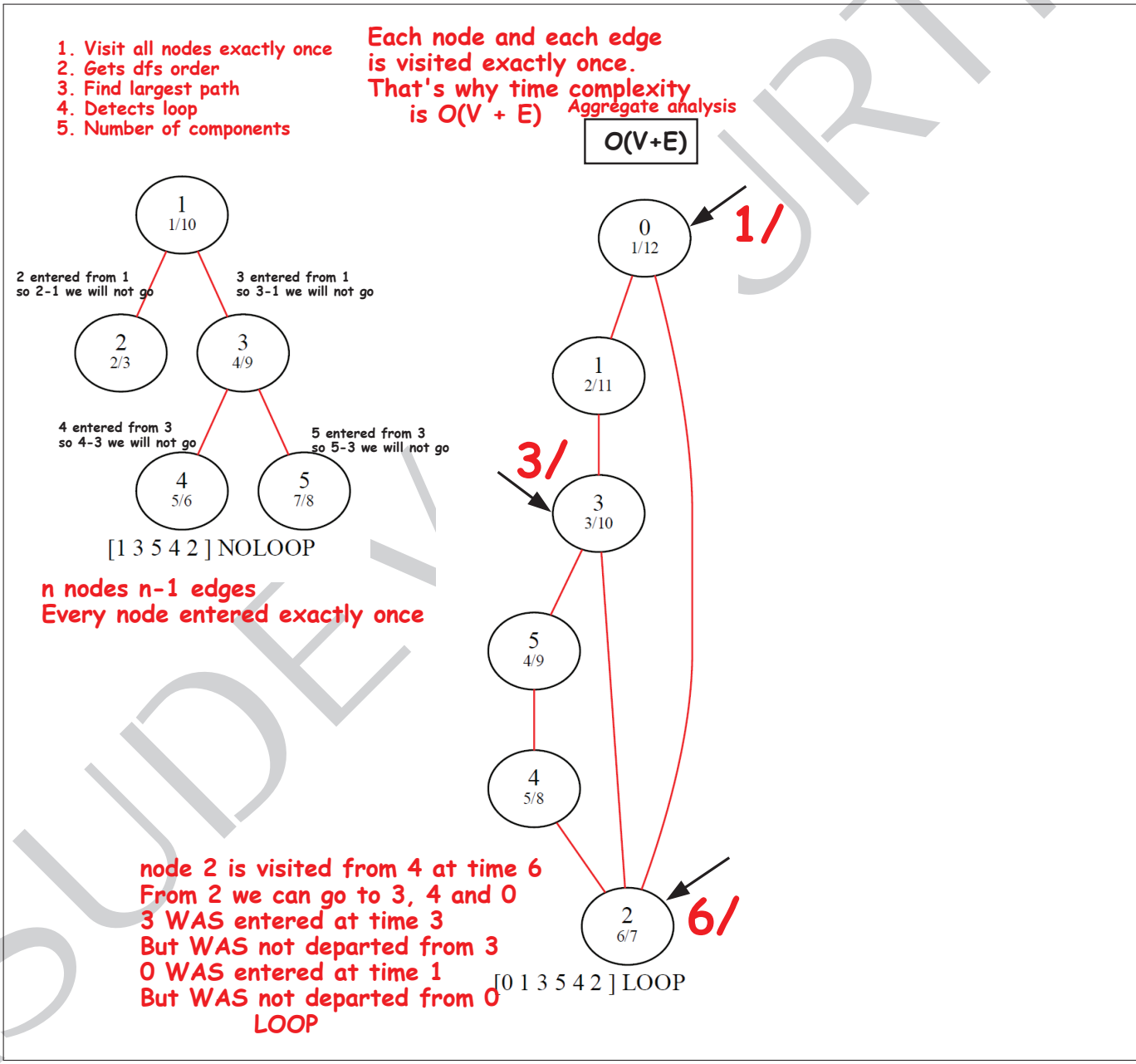

Figure 18.34: Depth first search on an undirected graph

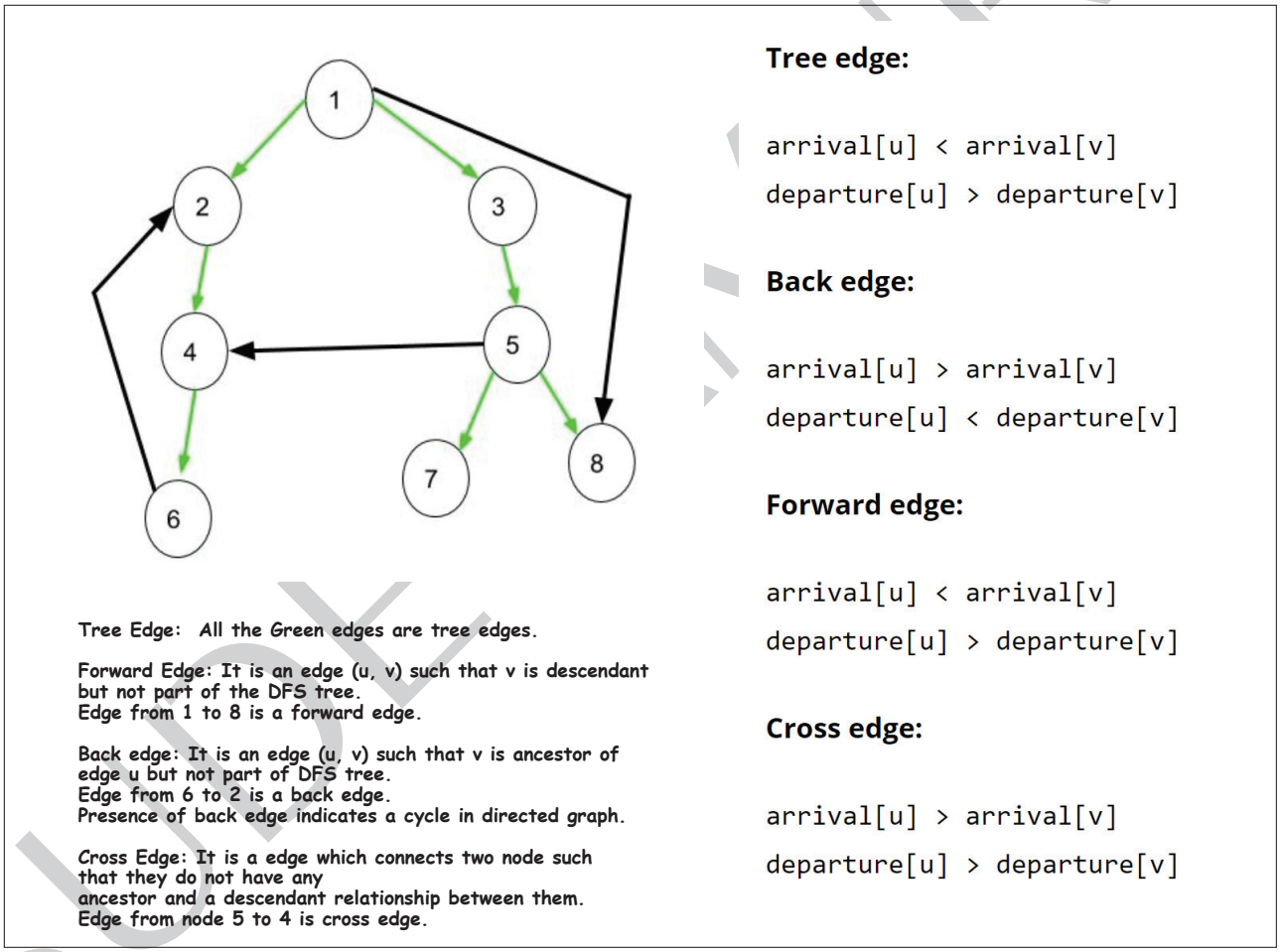

Figure 18.35: classification of edges in a directed graph

18.11.1 Depth first search on a undirected graph with no loop

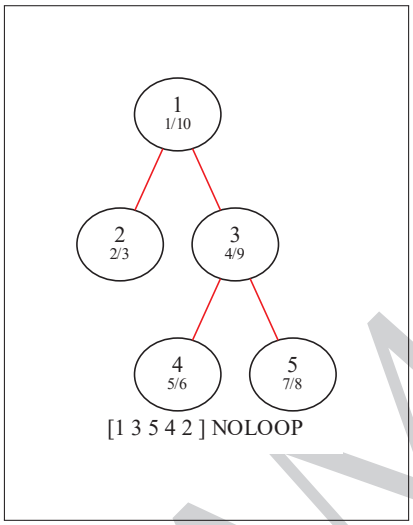

Figure 18.36: undirected graph with no loop


```
## Jagadeesh Vasudevamurthy ####
## dot -Tpdf C:\scratch\outputs\dot\1dfs.dot -o C:\scratch\outputs\dot\1dfs.dot.pdf
digraph g {
   label = "[1 3 5 4 2 ] NOLOOP"
   1[label = <1<BR /><FONT POINT-SIZE="10">1/10</FONT>>]
   2[label = <2<BR /><FONT POINT-SIZE="10">2/3</FONT>>]
   3[label = <3<BR /><FONT POINT-SIZE="10">4/9</FONT>>]
   4[label = <4<BR /><FONT POINT-SIZE="10">5/6</FONT>>]
   5[label = <5<BR /><FONT POINT-SIZE="10">7/8</FONT>>]
edge [dir=none, color=red]
   1 -> 2
   1 -> 3
   3 -> 4
   3 -> 5
}
```


18.11.2 Depth first search on a undirected graph with loop

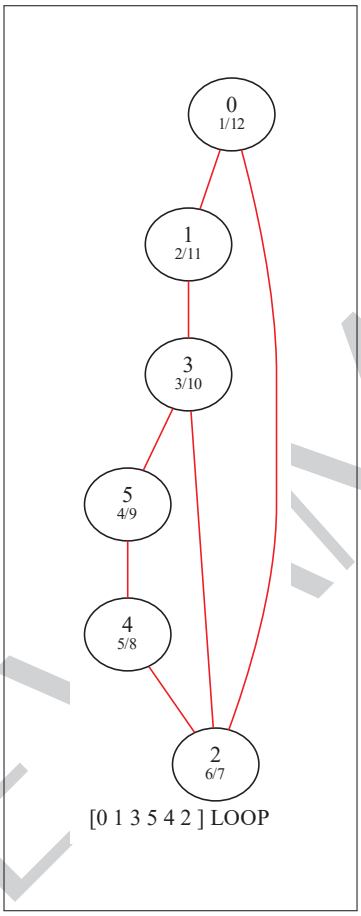

Figure 18.37: undirected graph with loop


```
## Jagadeesh Vasudevamurthy ####
## dot -Tpdf C:\scratch\outputs\dot\udf1dfs.dot -o C:\scratch\outputs\dot\udf1dfs.dot.
digraph g {
   label = "[0 1 3 5 4 2 ] LOOP"
   0[label = <0<BR /><FONT POINT-SIZE="10">1/12</FONT>>]
   1[label = <1<BR /><FONT POINT-SIZE="10">2/11</FONT>>]
   3[label = <3<BR /><FONT POINT-SIZE="10">3/10</FONT>>]
   5[label = <5<BR /><FONT POINT-SIZE="10">4/9</FONT>>]
   4[label = <4<BR /><FONT POINT-SIZE="10">5/8</FONT>>]
   2[label = <2<BR /><FONT POINT-SIZE="10">6/7</FONT>>]
edge [dir=none, color=red]
   0 -> 1
   0 -> 2
   1 -> 3
   3 -> 5
   3 -> 2
   5 -> 4
   4 -> 2
}
```


18.11.3 Depth first search on a directed graph with no loop

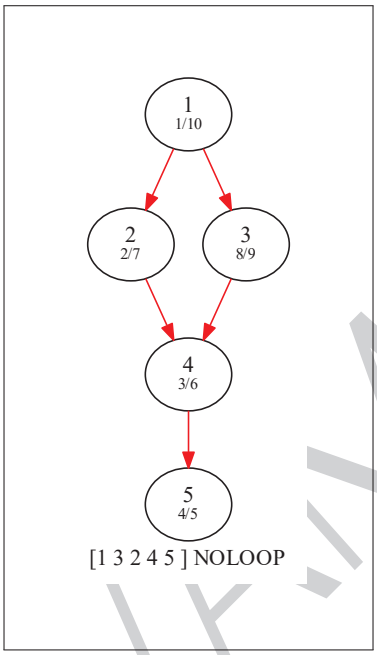

Figure 18.38: directed graph with no loop


```
## Jagadeesh Vasudevamurthy ####
## dot -Tpdf C:\scratch\outputs\dot\2dfs.dot -o C:\scratch\outputs\dot\2dfs.dot.pdf
digraph g {
   label = "[1 3 2 4 5 ] NOLOOP"
   1[label = <1<BR /><FONT POINT-SIZE="10">1/10</FONT>>]
   2[label = <2<BR /><FONT POINT-SIZE="10">2/7</FONT>>]
   3[label = <3<BR /><FONT POINT-SIZE="10">8/9</FONT>>]
   4[label = <4<BR /><FONT POINT-SIZE="10">3/6</FONT>>]
   5[label = <5<BR /><FONT POINT-SIZE="10">4/5</FONT>>]
edge [color=red]
   1 -> 2
   1 -> 3
   2 -> 4
   3 -> 4
   4 -> 5
}
```


18.11.4 Depth first search on a directed graph with loop

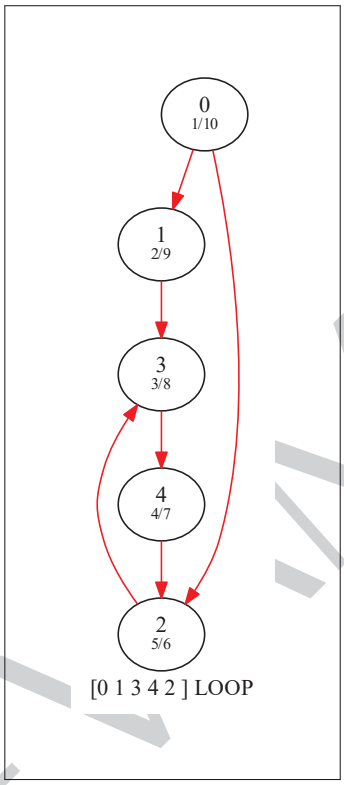

Figure 18.39: directed graph with loop


```
## Jagadeesh Vasudevamurthy ####
## dot -Tpdf C:\scratch\outputs\dot\3dfs.dot -o C:\scratch\outputs\dot\3dfs.dot.pdf
digraph g {
   label = "[0 1 3 4 2 ] LOOP"
   0[label = <0<BR /><FONT POINT-SIZE="10">1/10</FONT>>]
   1[label = <1<BR /><FONT POINT-SIZE="10">2/9</FONT>>]
   2[label = <2<BR /><FONT POINT-SIZE="10">5/6</FONT>>]
   3[label = <3<BR /><FONT POINT-SIZE="10">3/8</FONT>>]
   4[label = <4<BR /><FONT POINT-SIZE="10">4/7</FONT>>]
edge [color=red]
   0 -> 1
   0 -> 2
   1 -> 3
   2 -> 3
   3 -> 4
   4 -> 2
}
```


18.11.5 Depth first search on a directed graph with no loop

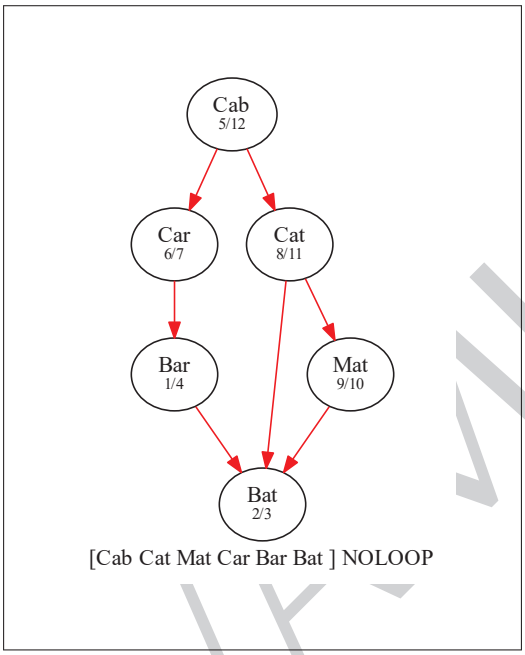

Figure 18.40: directed graph with no loop


```
## Jagadeesh Vasudevamurthy ####
## dot -Tpdf C:\scratch\outputs\dot\catdfs.dot -o C:\scratch\outputs\dot\catdfs.dot.pd
digraph g {
   label = "[Cab Cat Mat Car Bar Bat ] NOLOOP"
   Bar[label = <Bar<BR /><FONT POINT-SIZE="10">1/4</FONT>>]
   Bat[label = <Bat<BR /><FONT POINT-SIZE="10">2/3</FONT>>]
   Cab[label = <Cab<BR /><FONT POINT-SIZE="10">5/12</FONT>>]
   Car[label = <Car<BR /><FONT POINT-SIZE="10">6/7</FONT>>]
   Mat[label = <Mat<BR /><FONT POINT-SIZE="10">9/10</FONT>>]
   Cat[label = <Cat<BR /><FONT POINT-SIZE="10">8/11</FONT>>]
edge [color=red]
   Bar -> Bat
   Cab -> Car
   Cab -> Cat
   Car -> Bar
   Mat -> Bat
   Cat -> Bat
   Cat -> Mat
}
```


18.11.6 Depth first search on a directed graph with no loop

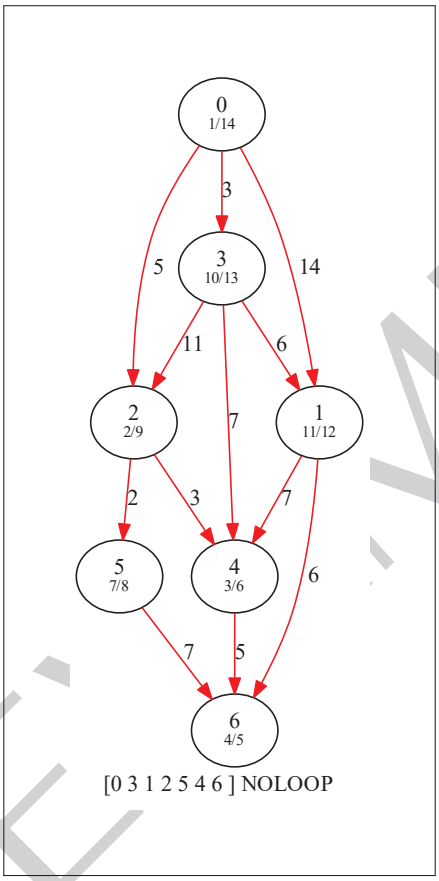

Figure 18.41: directed graph with no loop


```
## Jagadeesh Vasudevamurthy ####
## dot -Tpdf C:\scratch\outputs\dot\7dfs.dot -o C:\scratch\outputs\dot\7dfs.dot.pdf
digraph g {
   label = "[0 3 1 2 5 4 6 ] NOLOOP"
   0[label = <0<BR /><FONT POINT-SIZE="10">1/14</FONT>>]
   2[label = <2<BR /><FONT POINT-SIZE="10">2/9</FONT>>]
   3[label = <3<BR /><FONT POINT-SIZE="10">10/13</FONT>>]
   1[label = <1<BR /><FONT POINT-SIZE="10">11/12</FONT>>]
   6[label = <6<BR /><FONT POINT-SIZE="10">4/5</FONT>>]
   4[label = <4<BR /><FONT POINT-SIZE="10">3/6</FONT>>]
   5[label = <5<BR /><FONT POINT-SIZE="10">7/8</FONT>>]
edge [color=red]
   0 -> 2 [label = 5]
   0 -> 3 [label = 3]
   0 -> 1 [label = 14]
   2 -> 4 [label = 3]
   2 -> 5 [label = 2]
   3 -> 2 [label = 11]
   3 -> 1 [label = 6]
   3 -> 4 [label = 7]
   1 -> 6 [label = 6]
   1 -> 4 [label = 7]
   4 -> 6 [label = 5]
   5 -> 6 [label = 7]
}
```


18.11.7 Implementing depth first search

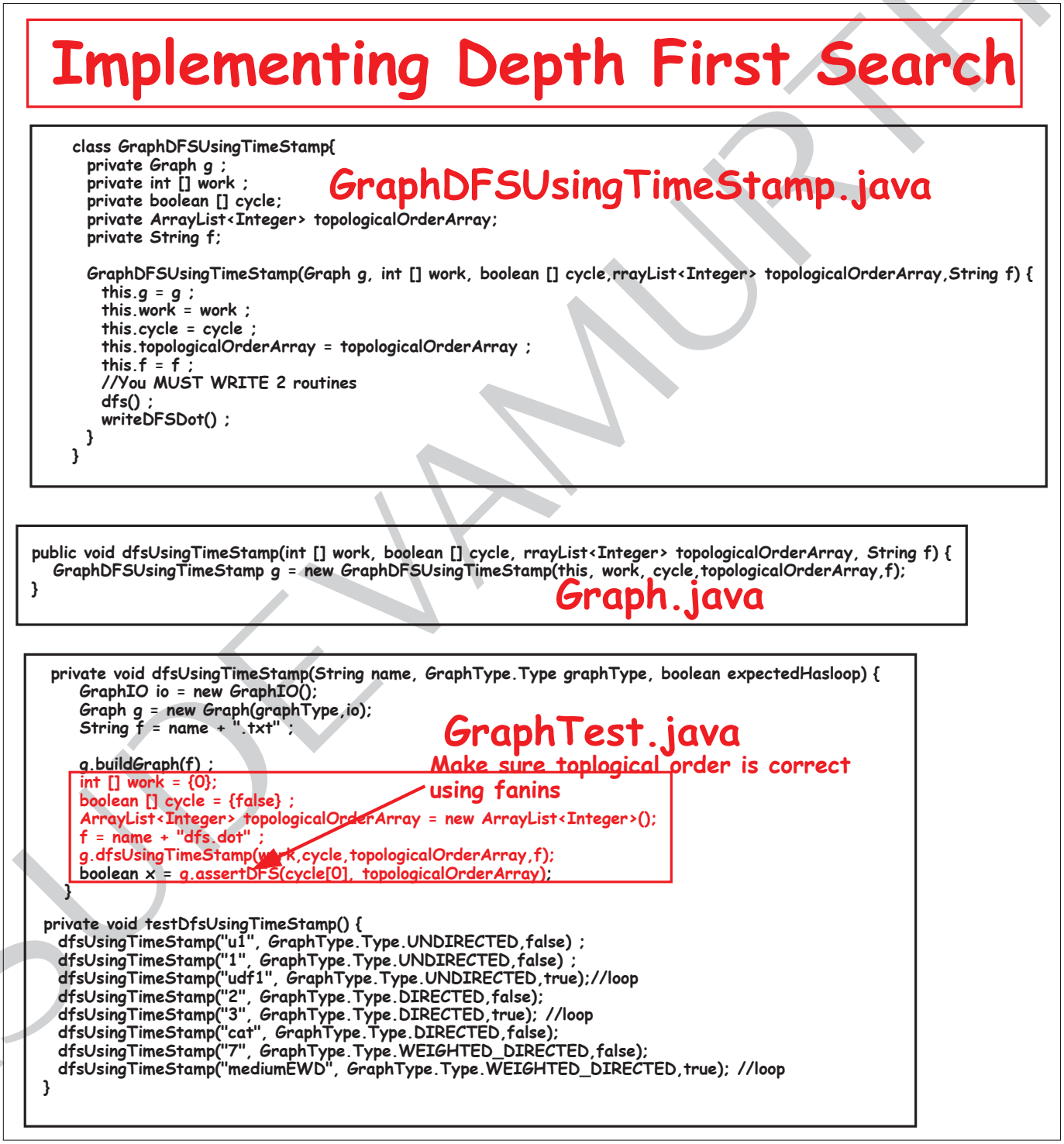

Figure 18.42: Implementing depth first search