Depth-first Search in Digraphs — examples

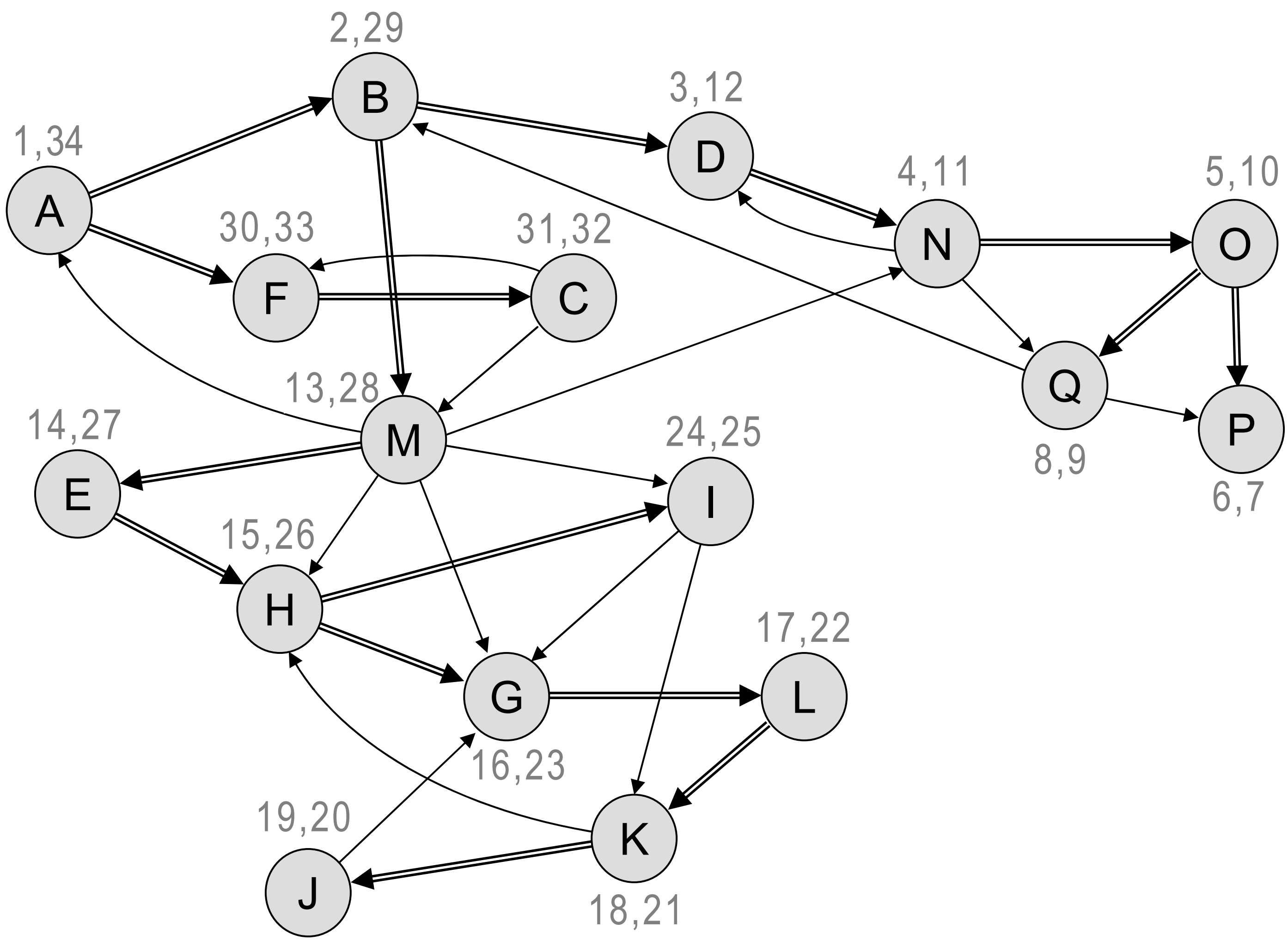
$\Longrightarrow$ denotes a tree edge.

$d(v), f(v)$ appears above or below each node v:

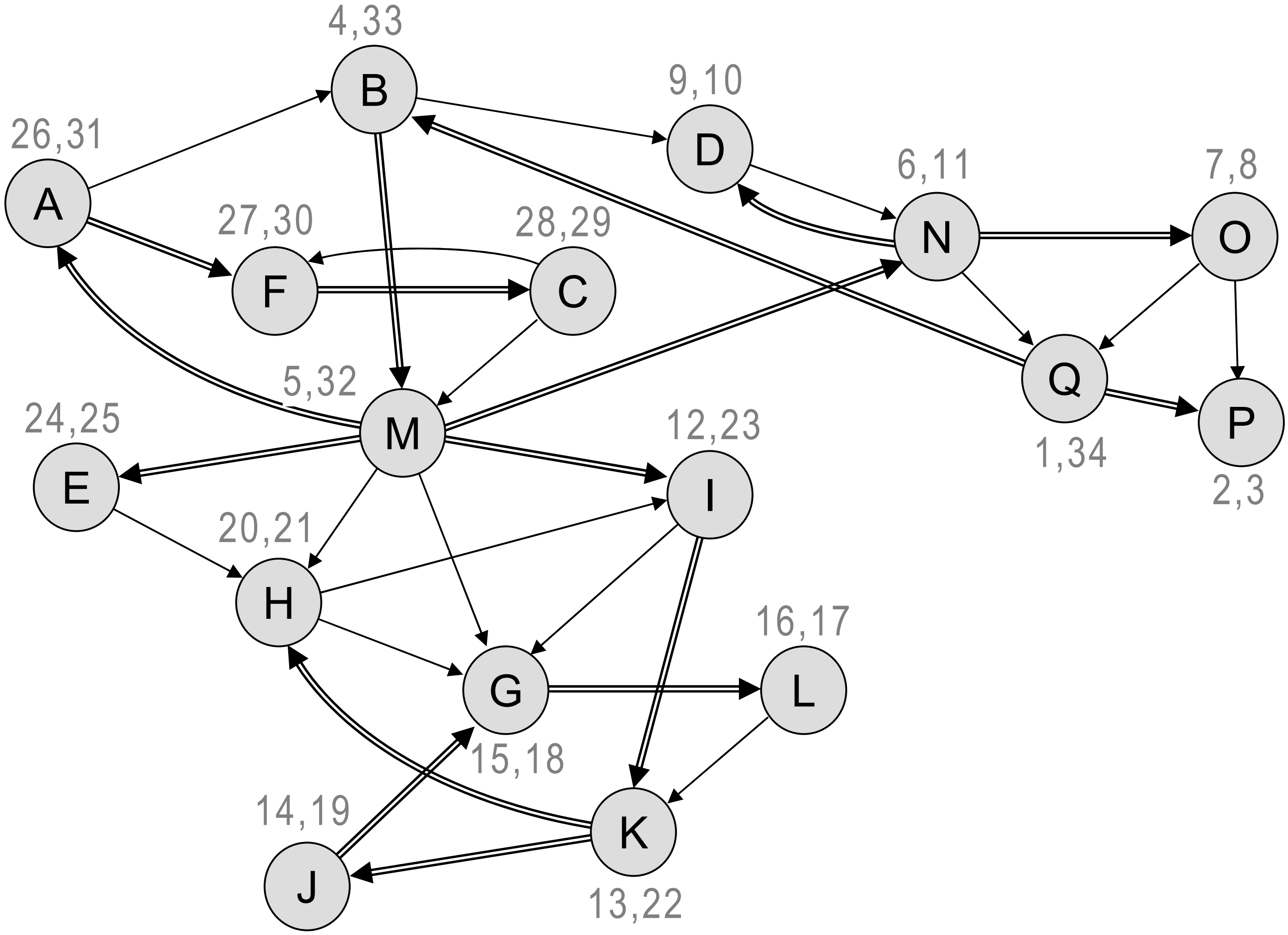
- $d(v)$ = *discovery time* of node v. The time at which node v is first reached. The time of *preorder processing*.
- $f(v)$ = *finish time* of node v. The time at which node v is exited for the last time. The time of *postorder processing*.

For a node v, *active*(v) = time interval $d(v)$ to $f(v)$ (inclusive).

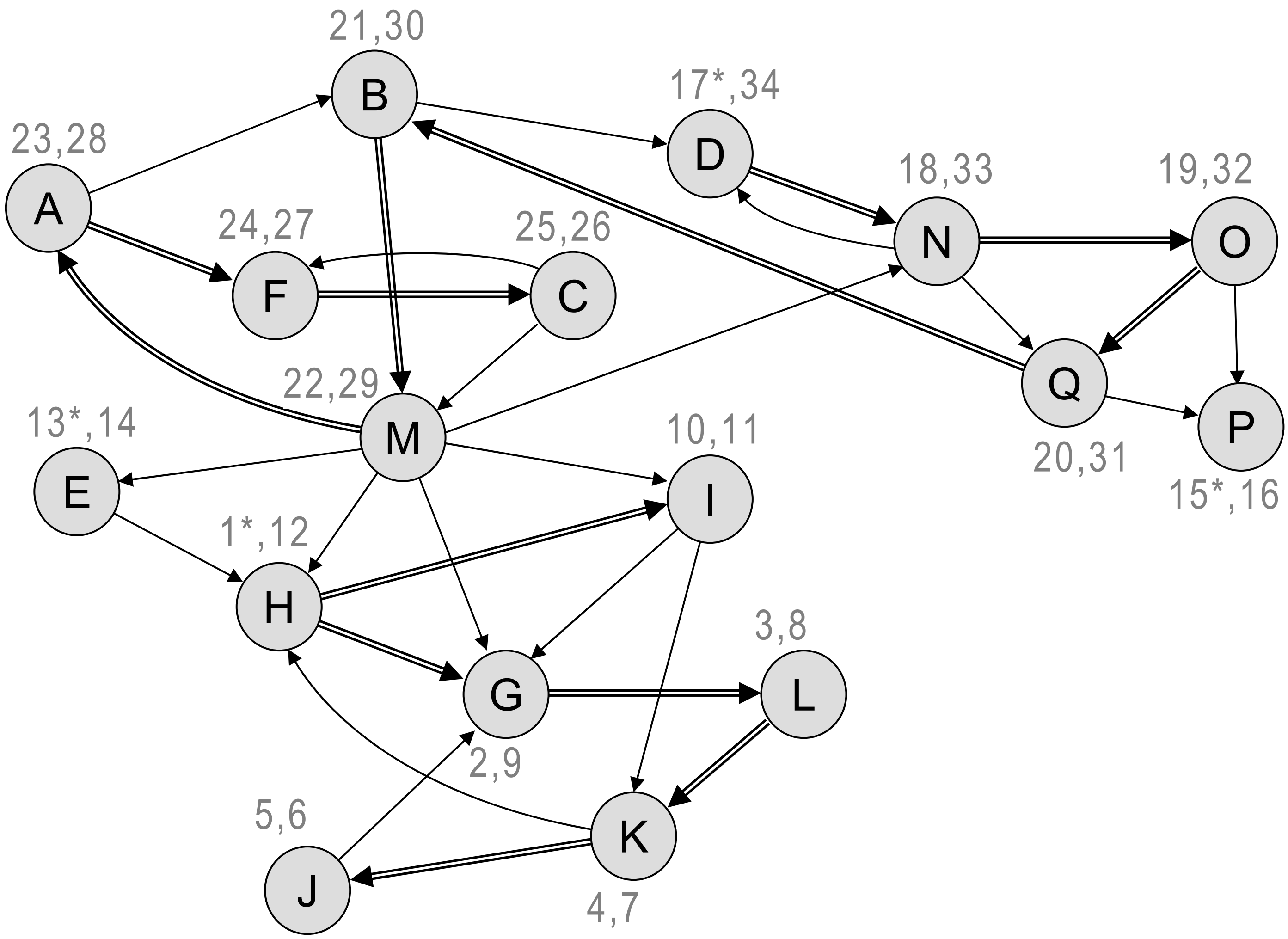
Example 1: In this particular depth-first search, the alphabetically-first node is chosen, whenever an arbitrary choice is made.



Example 2: Depth-first search of the same digraph. The alphabetically-last node is chosen, whenever an arbitrary choice is made.



Example 3: Depth-first search of the same digraph. In choosing among adjacent vertices not yet discovered, the alphabetically-first vertex is chosen. However, we choose H as the starting vertex, and when the stack becomes empty (which didn't occur in Example 1 or 2), we choose E, then P, and then D as the next vertex to discover.



Depth-first Search in Digraphs — edges classified

Edge (u,v) is

a *tree edge* if	$active(u) \supset active(v)$, and there is no vertex x with $active(u) \supset active(x) \supset active(v)$,
a *forward edge*	if $active(u) \supset active(v)$, but (u,v) is not a tree edge,
a *back edge*	if $active(u) \subset active(v)$,
a *cross edge*	if $active(u) \cap active(v) = \emptyset$ (in which case $active(v)$ entirely precedes $active(u)$.

denotes a *tree edge*.

denotes a *back edge*.

denotes a *forward edge*.

denotes a *cross edge*.

In an undirected graph, these two types are not distinguishable

Here depth-first search of Example 1, with edges classified.