Mitchell and Merritt's Algorithm for the Single-Resource Model

- Belongs to the class of edge-chasing algorithms where probes are sent in opposite direction of the edges of WFG.
- When a probe initiated by a process comes back to it, the process declares deadlock.
- Only one process in a cycle detects the deadlock. This simplifies the deadlock resolution – this process can abort itself to resolve the deadlock.

- Each node of the WFG has two local variables, called labels:
  1. a private label, which is unique to the node at all times, though it is not constant, and
  2. a public label, which can be read by other processes and which may not be unique.
- Each process is represented as u/v where u and u are the public and private labels, respectively.
- Initially, private and public labels are equal for each process.
- A global WFG is maintained and it defines the entire state of the system.

- The algorithm is defined by the four state transitions shown in Figure 2, where z = inc(u, v), and inc(u, v) yields a unique label greater than both u and v labels that are not shown do not change.
- Block creates an edge in the WFG.
- Two messages are needed, one resource request and one message back to the blocked process to inform it of the public label of the process it is waiting for.
- Activate denotes that a process has acquired the resource from the process it was waiting for.
- Transmit propagates larger labels in the opposite direction of the edges by sending a probe message.

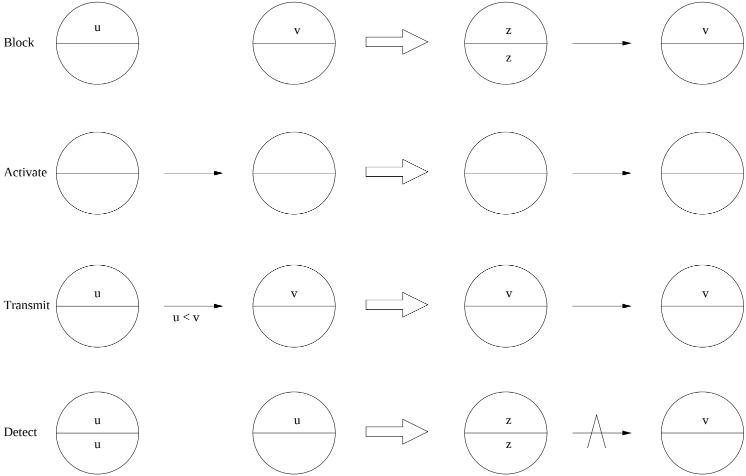

Figure 2: The four possible state transitions

- Whenever a process receives a probe which is less then its public label, then it simply ignores that probe.
- Detect means that the probe with the private label of some process has returned to it, indicating a deadlock.
- The above algorithm can be easily extended to include priorities where whenever a deadlock occurs, the lowest priority process gets aborted.

Message Complexity:

If we assume that a deadlock persists long enough to be detected, the worst-case complexity of the algorithm is s(s - 1)/2 Transmit steps, where s is the number of processes in the cycle.