COMP480 Oral Messages Algorithm
Lamport's Algorithm $OM(m)$
Byzantine Generals Oral Messages [1]

Algorithm OM(0)

1) Commander i send out a value $v \in \{0, 1\}$ to every lieutenant $j \neq i$
2) Each lieutenant j accepts the value from i as the *order* from commander i

Algorithm OM(m)

1) Commander i sends out a value $v \in \{0, 1\}$ to every lieutenant $i \neq j$.
2) If $m > 0$, then each lieutenant j, after receiving a value from the commander, starts a new phase by broadcasting it to the *remaining* lieutenants using $OM(m-1)$. In the phase, j acts as the commander. Each lieutenant thus receive $(n-1)$ values:
   a) a value *directly* received from the commander i of $OM(m)$ and
   b) $(n-2)$ lieutenants resulting from their broadcast $OM(m-1)$. If a value is not received, then it is substituted by a *default* value.
3) Each lieutenant chooses the *majority* of the $(n-2)$ values received by it as the *order* from the commander i.

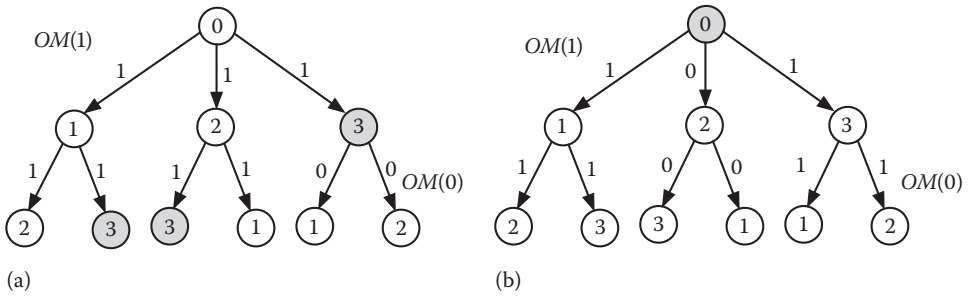

Figure 1. An illustration of $OM(1)$ with four generals and one traitor: the messages at the upper level reflect the opening messages of $OM(1)$, and those at the lower level reflect the $OM(0)$ messages that are triggered by the upper level message. The left-hand figure, Lieutenant 3 is the traitor and the right-hand figure shows Commander 0 as the traitor.

References

[1] Sukumar Ghosh. *Distributed systems: an algorithmic approach*. CRC press, 2014.