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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Messages | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (m) | | | | | | | | | | | | | - | | base algorithm message | | | | | | | | |  |
|  | (marker: weight) | | | | | | | | | | | | | - | | snapshot algorithm message | | | | | | | | |  |
|  | (report: id, snapshot, weight, round) | | | | | | | | | | | | | - | | report on snapshot | | | | | | | | |  |
|  |  | | | | | | | | | | | | |  | |  | | | | | | | | |  |
| Variables | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | recordedP | | | | | | | - | | true if P takes local snapshot | | | | | | | | | | | | | | |  |
|  | weightP | | | | | | | - | | sum of weight of messages | | | | | | | | | | | | | | |  |
|  | roundP | | | | | | | - | | The round which the process is in | | | | | | | | | | | | | | |  |
|  | receivedReportFromP | | | | | | |  | | A list of process ids from which report messages arrived in the current round | | | | | | | | | | | | | | |  |
|  | resultsP | | | | | | |  | | A list in the initiator to collect the results of the network | | | | | | | | | | | | | | |  |
|  | markerp[c] | | | | | | | - | | true if the marker message arrived to P through channel c | | | | | | | | | | | | | | |  |
|  | stateP[c] | | | | | | | - | | a stack holding the messages to P arrived from channel c after the local snapshot in P | | | | | | | | | | | | | | |  |
|  |  | | | | | | |  | |  | | | | | | | | | | | | | | |  |
| Initialize | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | recordedP | | | | | | | ← | | false | | | | | | | | | | | | | | |  |
|  | weightP | | | | | | | ← | | 0 | | | | | | | | | | | | | | |  |
|  | roundP | | | | | | | ← | | 0 | | | | | | | | | | | | | | |  |
|  | receivedReportFromP | | | | | | | ← | | ∅ | | | | | | | | | | | | | | |  |
|  | resultsP | | | | | | | ← | | ∅ | | | | | | | | | | | | | | |  |
|  | makerp[c] | | | | | | | ← | | false for all channel c | | | | | | | | | | | | | | |  |
|  | stateP[c] | | | | | | | ← | | ∅ for all channel c | | | | | | | | | | | | | | |  |
|  | if P wants to initiate snapshot | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | perform procedure TakeSnapshot | | | | | | | | | | | | | | | | | | | | | | |  |
|  | end if | | | | | | | | | | | | | | | | | | | | | | | |  |
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| Algorithm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **if *P* receives a basic message *(m)* through incoming channel *c*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **if** ***recordedP*** = true and ***makerP[c]***= false | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | | ***stateP[c]*** ← append(***stateP[c]***, ***(m)***) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | |  | |  | |  | |  | | |  | | |  | | |  | | |  | | |  | | |  | | |  | |  | |  | |  | |  | |  | |  | |  | |  |  |
|  | **if *P* receives *(marker)* through incoming channel *c*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | ***weightP***← ***weightP***+ ***(marker).weight*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | perform procedure TakeSnapshot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | ***markerp[c]***← true | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **if** ***makerp[c]*** = true for all incoming channels then | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | | Perform procedure EndSnapshot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
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|  | **if *P* receives *(report)* through incoming channel *c*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **if** ***(report).id*** not in ***receivedReportFromP*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | ***receivedReportFromP*** ←append( | | | | | | | | | | | | | | | | | | | | | | | | | | ***receivedReportFromP*** | | | | | | | | | | | | | | | | | | |  |
|  |  |  | |  | |  | |  | |  | | |  | | |  | | |  | | |  | | |  | | | ***(report).id*)** | | | | | | | | | | | | | | | | | | |  |
|  |  | | **if** ***P*** is initiator | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | |  | | ***resultsP*** ←append(***resultsP*, *(report).snapshot*)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | |  | | ***weightP***← ***weightP***+ ***(report).weight*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  | |  | |  |
|  |  | |  | | **if *weightP*** = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | |  | | **if *roundP* < *MaxRouns*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | |  | |  | | perform procedureTakeSnapshot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | |  | | **else** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | |  | |  | | terminate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | |  | | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | | **else** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | | send the message to all the neigbors | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |
|  |  | |  | |  | |  | |  | |  | | |  | | |  | | |  | | |  | | |  | | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |

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|  | **Procedure TakeSnapshot** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **if** ***recordedP*** = false | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | **roundP** ← **roundP + 1** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | take local snapshot of the state of ***P*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | ***recordedP*** ← true | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | ***receivedReportFromP*** ← ∅ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | ***weightP***← ***weightP***/ 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | send ***(marker: weightP /*** num of neighbors***)*** | | | | | | | | | | | | | | | | | | | | | | | | | |  | | | | | | | | | | |  |
|  |  |  |  | | into each outgoing channel of ***P*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **end if** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  |  | |  | |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | |  | |  | |  | |  |  |
|  | **Procedure TakeSnapshot** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | if P is initiator | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | resultP ← append (resultP , snapshotP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | else | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  | send (report: idP, snapshotP, weightP, roundP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  |  | |  | |  |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | |  | |  | |  | |  | |  |
|  | receivedReportFromP ← append(receivedReportFromP , idP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | makerP[c] ← false for all channel c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | stateP[c] ← ∅ for all channel c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  |  |  | |  | |  |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | |  | |  | |  | |  | |  |
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