Register implementations out of faulty base registers

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Failure modes

- Responsive: once \( \perp \), forever \( \perp \)
- Non-responsive: no reply

\( t \) denotes the number of base objects that can fail

NB. In the asynchronous model, it is impossible to distinguish a non-responsive from a slow object.
Algorithms

(1) Implements a SWMR register out of t+1 SWMR base responsive failure-prone registers

(2) Implements a SWSR register out of 2t+1 SWSR base non-responsive failure-prone registers
Responsive model

Write(v)
  For j = 1 to (t+1) do
    Reg[j].write(v);
  return(ok)

Read()
  For j = t+1 to 1 do
    v := Reg[j].read();
    if v ≠ ⊥ then return(v)
Non-responsive model

Init:  seq := 1

Write(v)

w_seq := w_seq + 1;
For j = 1 to (2t+1) do:
Reg[j].write(w_seq, v);
« wait until a majority of oks are returned »
return(ok)
Non-responsive model

Init: \((sn, val) := (-1, \bot)\);

Read()

For \(j = 1\) to \((2t + 1)\) do:

\((s, v) := \text{Reg}[j].\text{read()}\);

\((sn, val) := (s, v)\) with the highest \(s\) from majority, including \((sn, val)\)

return \((val)\)