CORRIGENDUM

ELECTION IN A COMPLETE NETWORK WITH A SENSE OF DIRECTION

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Lisa Higham of the University of British Columbia has pointed out a subtle error in the algorithm presented in our paper [1].

Suppose the id’s 1, 2, . . . , N are placed in increasing order around the ring formed by taking link number 1 at each processor. Higham constructed the following execution of our algorithm that uses 4N messages:

1. Each processor sends its id to its neighbor at distance 1.
2. Processor 1 receives id N, and processor 2 receives id 1.
3. Processor 1 receives id 2 and forwards it to processor N.
4. Processor 2 receives id N, and processor 3 receives id 2.
5. Processor 2 receives id 3 and forwards it to processor N.

This execution continues, with four transmitted messages for each processor that becomes passive.

We can correct the algorithm to achieve 3.62N messages, as claimed in our paper, by forcing the algorithm to operate in phases. Simply include the phase number in each message, and modify the RECEIVE procedure to deliver messages in order of increasing phase number; processors buffer messages with phase numbers greater than the phase number expected. The analysis in our paper applies to this corrected algorithm.

There was also a mistake in the last statement of the original algorithm, which was

\[ \text{SEND}(N - D; N - (D + E), \text{Newid}). \]

This statement should be replaced by

\[ \text{SEND}(N - D; N - D + E, \text{Newid}), \]

where the expression \( N - D + E \) is interpreted \( \text{mod} N \).

Reference