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"Software Updates for Sensor Networks in Changing Process Environments"

On the long run, sensor networks become more and more important in the life sciences. Sensor networks consist of hundreds of small and autarkic working sensor nodes which contain at least a microcontroller, a radio interface and some sensors. One of their objectives is monitoring the laboratory to prevent accidents caused by e.g. elevated concentrations of gases.
Changing measuring processes require changing software programs on all small sensor nodes to determine and react on altering sources of danger adaptively. To avoid recollecting hundreds of sensor nodes, software updates are distributed over the air (OTA) using radio transmissions from one sensor node to another. In practice, concurrent radio transmissions of multiple sensor nodes result in collisions and therefore destroyed messages. Due to required segmenting of programs in several messages, most sensor nodes may be updated incompletely. Thus, a successful update process requires a protocol to handle these errors.
We present a new flashing protocol for sensor networks to control message transmissions, forwarding and correction of defective programs. It reduces the number of messages and, therefore, the number of collisions compared to broadcast-based methods considerably. Further, the proposed schema is very robust to partly updated sensor nodes and it corrects non-updated sensor nodes automatically. The small number of transmissions and the guaranteed corrections of faulty programs results in very fast software update process on all sensor nodes in range.