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Non-Intrusive Remote Oscillator Measurement for Distributed Systems based on FlexRay

key words: FlexRay, distributed system, quartz measurement, bus topology

The invention concerns a method for remote measuring the nodes' quartz frequencies within a distributed system based on FlexRay. The proposed approach uses the clock correction mechanism and more especially the integrated *damping factor*, which slightly shifts the node's internal clock correction term and its resulting time base. This method was invented by researchers of the TU Wien.

Background

Distributed systems are relying on bounded quartz drifts to operate correctly. However, the quartz nominal frequency evolves with the time (due to, e.g., ageing effect, temperature or shocks), and therefore the capacity to periodically measure their current frequency is required for system diagnosis. Standard methods are quite intrusive: they require physical access to each single node and might interrupt system operation. The proposed approach enables the remote measurement of oscillators without influencing normal system operation.

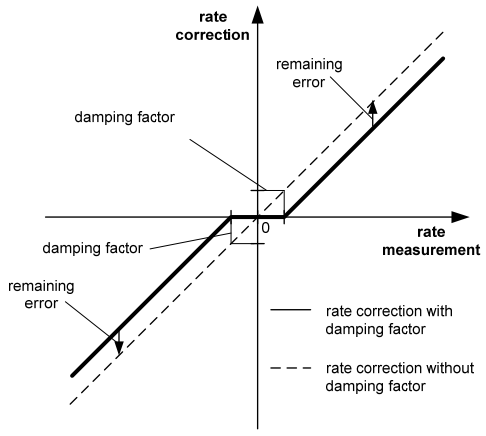

Fig. 1: Effects of the damping factor

Benefits

- Fast operation (few seconds; concurrent measurement for all nodes within the system)
- Remote operation
- Concurrent to normal system operation

Technology

The invention only requires a tester node connected to the communication medium. This dedicated node performs a deterministic replay to control the synchronized logical time base and step through different frequencies. Then, the remaining error for each node is measured to gain information on their underlying quartz. Note here that our deterministic replay does not interrupt or disturb the ongoing operation and is not a threat for the system.

Potential Applications

- Embedded diagnosis tool (e.g., black box)
- Integrated in the car's architecture for online fault handling and recovery
- External tool for offline maintenance (garage)

Cooperation Options

License agreement, development partnership

Development Status

A prototype has been successfully developed using a bus topology and has been tested with several Flex-Ray configurations.

Status of the Patent

AT, EP patents granted

Inventor

Eric Armengaud

TU WIEN | **Research and Transfer Support** | Heinz Gödl
Karlsplatz 13/E058-02 | A-1040 Vienna | T: +43.1.58801.41536 | F: +43.1.58801.415980
E: heinz.goedl@tuwien.ac.at | http://www.rt.tuwien.ac.at