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SENSOR INTERSECTION – A NEW PARADIGM

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Abstract. *The difference in sensors' readings can be exploited to reveal phenomena other than the measured quantities. Two examples of extracting information beyond what is directly measured by these sensors are presented. The first example describes the identification of the environment in which an autonomous guided vehicle is moving, based on the difference between measurements from odometry and triangulation systems. The original intent of these two sensor systems is to track the trajectory of an autonomous guided vehicle. The roughness of the floor is classified and identified from the difference between the sensors' readings, with the aid of neural networks. The second example describes the detection of intermittent contact in flexibly mounted rotor mechanical face seal. The intermittent contact causes high harmonic oscillations that can be detected through complicated power spectrum analysis of the proximity probes signals measuring the clearance or, similar sensor fusion techniques. However, it is shown that a simple analysis of the difference in variance of the probes' clearance readings may provide accurate indication whether such contact occurs, without relating to the actual measurements of the gap. It is suggested that the process of detecting phenomena from the differences in sensors' measurements will be called "Sensor/Information Intersection", to be distinguished from "Sensor Association", or, "Sensor Fusion", in which the data are complementing each other and are used to confirm the directly sensed, or, measured quantity.*
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1. **Introduction.** In many cases the difference in the reading of different sensors can be exploited to reveal phenomena or identify system states, which are not associated directly with the measured or, sensed quantity. For sensor based on different physical principles the difference in readings is probably due to the different combined dynamical response of the system and the sensors to various stimulations (including, but not limited only to the measured ones). If the sensors are identical, but installed in different locations of the system, their dynamic behaviors may, again, be different showing different time-dependent characteristics, even though their final steady-state or, average readings are the same.

Two examples of extracting information, which is different in nature from the sought information for which these sensors were originally installed, are presented. The first example describes the identification of the environment in which an autonomous guided vehicle (AGV) is moving. Originally, two different systems of sensors were installed in