REDUCING UNCERTAINTIES IN PRECRASH-SENSING WITH RANGE SENSOR MEASUREMENTS

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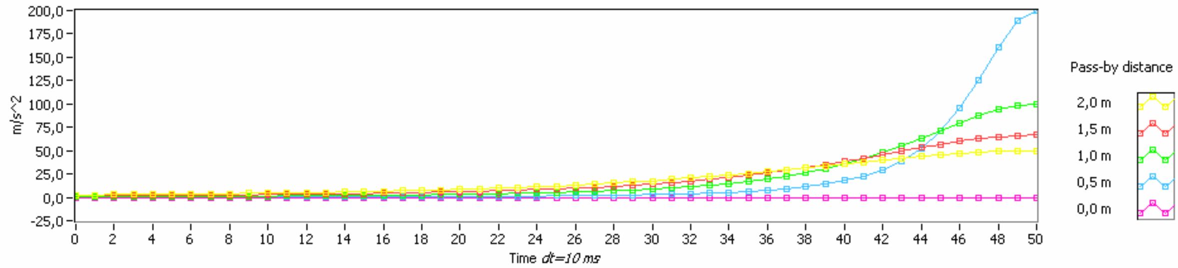
ABSTRACT

Advanced information about the collisions becomes important for the continuing development of preventive and active safety systems. Thus, any available information before an inevitable accident becomes important. Besides control of reversible restraints in advance of a crash, the PreCrash-information can also be used to enhance crash classification and to control the pyrotechnical restraints. In the scope of the European project PREVENT, Bosch develops and validates systems that contribute to the targets for road safety set by the European commission transport policy for 2010.

Vehicle surround sensing systems employing one or more sensors, together with other subsystems, require tracking of multiple observations that includes both, true objects and false alarms, to describe the environment. Parameters as closing-velocity or time-to-impact can be estimated, to detect relevant objects for the PreCrash-functions. This information is included in the *Crash Object Interface* and it is used to implement a multifunctional system that fulfils the requirements of different functions as PreSet, PreFire, pedestrian protection, and even collision mitigation. This information is inherently uncertain, due to measurement errors and its propagation in the processing algorithms. In this paper, it is dealt with the considered errors in the PreCrash-Sensing algorithms development, when range sensors are used.

Close range surround sensing in vehicles is specially demanding of the accuracy of estimates, due to the high reliability required in threat situations. The considered errors can be classified into random (e.g. sensor measurement uncertainty) and systematic (e.g. processing delays). Furthermore, when an object passes by the sensor at close range, a large geometry-induced acceleration is seen for the slant range even though the object has itself no acceleration[1]. The closer the object passes by the radar, the larger is the maximum geometry-induced acceleration seen for the slant range. This systematic error causes tracking to be more difficult. Hence, new approaches for object tracking are developed, and current methods of other surveillance systems are adapted to vehicle environment. In the first part of this paper, the architecture design and errors are described. In the second part, approaches for reducing uncertainties are discussed. In order to demonstrate the performance of the system, current approaches focus on a prototype realisation with a multiple radar sensor-system.



Geometry-induced acceleration seen for the slant range for an object passing by the sensor with constant velocity

[1] Brookner, E., *Tracking and Kalman Filtering made easy*, John Wiley & Sons, Inc., 1998.