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Positioning technology of mobile vehicle using self-repairing heterogeneous sensor networks

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Abstract

Mobile vehicle positioning can provide the reference to navigation, tracking and multi vehicles collaboration. Applying spatiotemporal distribution characteristics of positioning errors between strap-down inertial navigation system (SINS) and wireless sensor network (WSN) approaches, a mobile vehicle positioning is proposed as a component of heterogeneous sensor networks (HSN). The attitude, velocity and position equations of mobile vehicle are derived based on the kinematics parameter constraints and inertial parameter errors. Meanwhile, WSN approach can provide position estimation using inaccurate anchor nodes. However, SINS is known for its cumulative errors over long time, while WSN approach can have large positioning errors in certain areas. As an effort to overcome the limitations of pure SINS or WSN approach, an integrated SINS and WSN approach is proposed to form a self-repairing HSN approach, which can provide sound position and attitude for mobile vehicle. Then, multi-parameter interaction and cooperative correction strategy are explored when SINS or WSN measurement is abnormal. Finally, a comprehensive set of experiments of position and attitude estimations for mobile vehicle are performed on the actual environment platform.

Keywords: mobile vehicle, heterogeneous sensor networks, position and

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