

An Integrated 5G, Geomagnetic, and Inertial Measurement Unit Fusion Approach for Indoor Positioning

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Abstract : With the widespread adoption of the Internet of Things and smart devices, the demand for indoor positioning technology with high accuracy and robustness continues to grow. Traditional positioning methods such as fingerprinting, channel parameter estimation techniques (TDoA, AoA), and Pedestrian Dead Reckoning (PDR) each have their limitations. Fingerprinting is highly sensitive to environmental changes, channel parameter estimation is only effective in line-of-sight conditions, and PDR is prone to sensor errors and magnetic interference. To overcome these limitations, multisensor fusion-based positioning methods have become a mainstream solution. This paper proposes a dynamic positioning system that integrates 5G TDoA, geomagnetic fingerprinting, and PDR. The system uses 5G TDoA for high-precision starting point positioning, corrects PDR heading with geomagnetic declination, and refines PDR positioning accuracy using geomagnetic fingerprints. Experimental results demonstrate that this method improves positioning accuracy and stability in complex indoor environments, overcoming the limitations of traditional methods and providing a reliable indoor positioning solution.

Keywords : 5G TDoA, magnetic fields, pedestrian dead reckoning, fusion location

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