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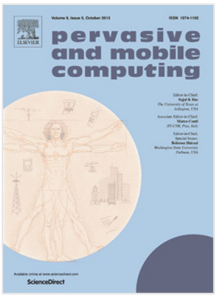

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Enhanced Radio Tomographic Imaging with Heterogeneous Bayesian Compressive Sensing

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Abstract

This work explores the novel use of Bayesian compressive sensing (BCS) in radio tomographic imaging (RTI), which aims at addressing the performance degradation of shadow fade imaging due to multipath fading interferences, through the sophisticated efforts on enhancing BCS with the capability of heterogeneous-noise-variance learning. Our contribution is twofold. Firstly, we incorporate a hierarchical model of heterogeneous noise variances into sparse Bayesian learning, which can contribute to the enhancement of BCS in terms of noise-variance awareness. Then, under our enhanced BCS (namely heterogeneous BCS) framework, we develop two learning algorithms for the reconstruction of shadow fade image. Theoretical analysis will show the potential advantages of using our heterogeneous BCS in mitigating the effect of multipath fading interferences, as well as in improving the imaging performance with our learning algorithms. Finally, the experimental results in the context of device-free localization and tracking are reported to demonstrate the effectiveness of the proposed approach.

Keywords: Radio tomographic imaging, Bayesian compressive sensing, Multipath fading interferences, Heterogeneous-variance model.

1. Introduction

Radio tomographic imaging (RTI) is an emerging technology for device-free localization (DFL) with received signal strength (RSS) measurements in

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