Joint Radar-Communication Prototype Implementing Spectral-Spatial Agility and Index Modulation

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Introduction

● DFRC Systems for Vehicular Applications
  ➢ Future cars implement both radar and communications on the same platform
  ➢ Two implementing approaches:
    • Use individual systems
    • Jointly design a dual function radar-communications (DFRC) system
  ➢ Benefits of DFRC systems
    • Improve the spectrum efficiency
    • Reduce system size, weight and power consumption
    • Alleviate concerns for electromagnetic compatibility

Theory

● Index Modulation based DFRC System
  ➢ Index modulation (IM)
    • Embed communications bits in transmission parameters
    • Possible domains: Spatial, spectral and time
  ➢ IM based DFRC techniques
    • Embed message into the combinations of radar waveform parameters
    • Have minimal degradation to radar performance

Contributions

● Contribution of This Prototype
  ➢ Implementing spectral-spatial IM based DFRC system using low cost automotive radar
  ➢ The prototype realizes communication without degrading the radar performance
  ➢ This DFRC system is promising to be applied in future intelligent transportation applications

Hardware Implementation

● Architecture of the Prototype

Graphical User Interface

● Simulation Mode

● Realtime Mode

Experiment Results

Communication BER

Radar Recovery