SenseComm: mmWaveTagsfor 5G-based Sensing

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1. Summary

- This project studies a retro-reflective millimeter-wave fiducial tag for reliable sensing in cluttered environments. The tag modulates a low-rate bitstream using Gold-code spread-spectrum coding while reusing a 5G-style OFDM waveform. Simulation results show reliable bit recovery under favorable SNR and increased reflected energy, demonstrating the feasibility of coded retro-reflective tags for ISAC applications.

2. Strengths

- The millimeter-wave echo strength is enhanced through physical antenna array gain without introducing active amplifiers using a Van Atta retro-reflective architecture.
- It enables seamless reuse of existing 5G waveforms without requiring additional hardware to transmit dedicated probing signals.
- The use of Gold-code spread-spectrum modulation enables accurate data recovery even in low signal-to-noise ratio environments.

3. Weakness

- The simulation is based on an AWGN channel and does not consider multipath fading in real channel.

4. Documentation: Is the artifact/code sufficiently documented?

Rate from 0% to 100%, where 0% means "documentation is completely insufficient" and 100% means "documentation is absolutely sufficient". If you need to assess both a dataset and tools, please take the average and comment below. In assessing tools, please consider if they are easy or difficult to install/set up and get to run. In assessing datasets, please consider if the meta data is sufficient.

Choices are:

- **1.** 0%
- **2.** 20%
- **3.** 40%
- **4.** 60%
- **5.** 80%
- **6.** 100%

Documentation: Comment on/explain your choice above:

- Rating: 6. 100%
- Scripts are well commented and README.md is organized clearly.

5. Completeness: Do the submitted artifacts/code include all of the key components described in the report?

Rate from 0% to 100%, where 0% means "does not include any key components" and 100% means "includes all key components".

Choices are:

- **1.** 0%
- **2.** 20%
- **3.** 40%
- **4.** 60%
- **5.** 80%
- **6.** 100%

Completeness: Comment on/explain your choice above

- Rating: 6. 100%
- includes complete OFDM link mapping, Gold-code modulation, and correlation-based decoding, along with scripts for hardware implementation.

6. **Exercisability: Do the submitted artifacts/code include the scripts and data needed to run the experiments described in the paper, and can the software be successfully executed?**

   Rate from 0% to 100%, where 0% means "the scripts/software cannot be successfully executed and/or no data is included" and 100% means "the artifact includes all necessary scripts/software and data, and scripts/software (if present) can be successfully executed".

   Choices are:
   - **1.** 0%
   - **2.** 20%
   - **3.** 40%
   - **4.** 60%
   - **5.** 80%
   - **6.** 100%

Exercisability: Comment on/explain your choice above

- Rating: 6. 100%
- Simulation part can be run with a single command.

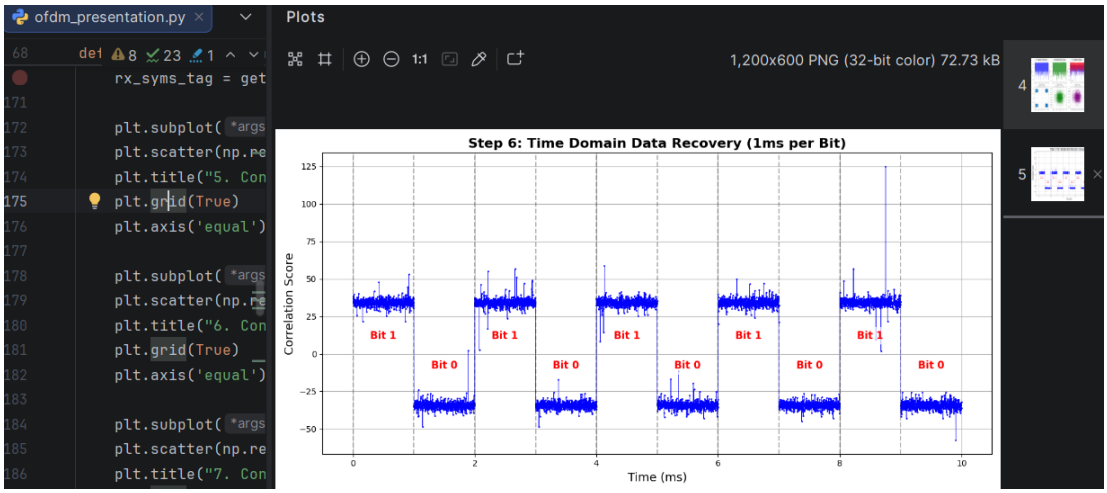
7. **Results attainable: Does the artifact/code make it possible, with reasonable effort, to obtain the key results from the artifact/code?**

   Rate from 0% to 100%, where 0% means "no results can be obtained" and 100% means "all results can be obtained".

   Choices are:
   - **1.** 0%
   - **2.** 20%
   - **3.** 40%
   - **4.** 60%
   - **5.** 80%
   - **6.** 100%

Results attainable: Comment on/explain your choice above

- Rating: 6. 100%
- Running the script successfully reproduces the Addition of Tag in Environment and Tag Data Bits Reconstruction figures.



8. **Results completeness: How many key results of the paper/report is the provided code meant to support?**

   Rate from 0% to 100%, where 0% means "the artifact is meant to support no key results" and 100% means "the artifact is meant to support all key results".

   Choices are:

   - **1.** 0%
   - **2.** 20%
   - **3.** 40%
   - **4.** 60%
   - **5.** 80%
   - **6.** 100%

Results completeness: Comment on/explain your choice above

- Rating: 6. 100%
- Both hardware and simulation results are provided by the code.

Reviewer Team member1 Name, Signature

Zhongze Xiang