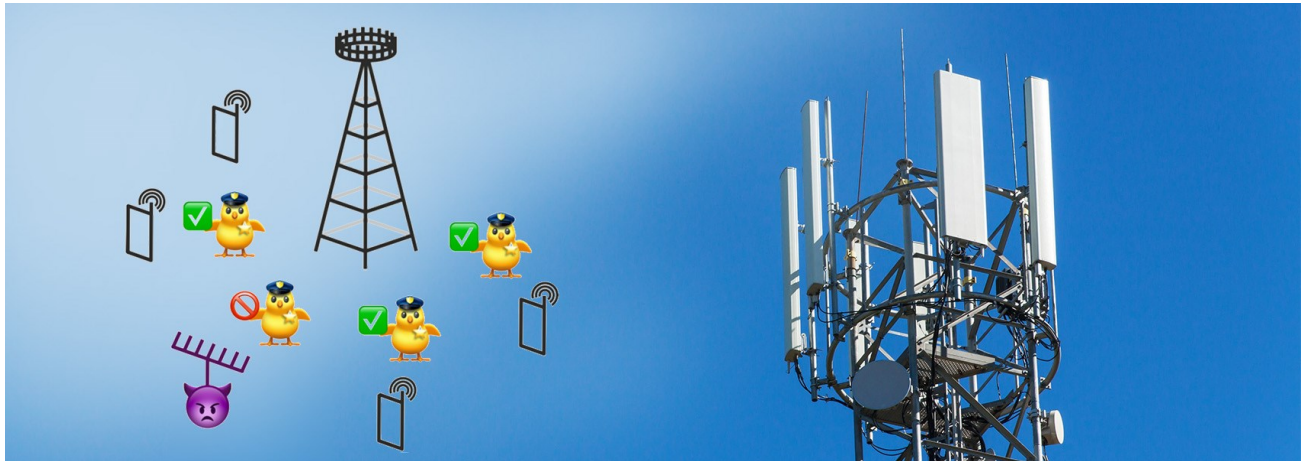# ETH zürich

Licensing Opportunity
Mitigation of jammers in wireless communication

Application

A communication system and method mitigate the interference of smart or multi-antenna jammers with radio signals. The invention benefits applications with multi-antenna receivers that need to defend against enviromental interference and/or hostile jamming such as remote controlling of drones or autonomous driving.

Features & Benefits

- universality against smart jammers
- low computational cost
- robust approach with linear computational operations, largely free of tuning parameters
- continuously deployable

Publication

- "Universal MIMO Jammer Mitigation via Secret Temporal Subspace Embeddings", 2023 Asilomar Conference on Signals, Systems, and Computers, https://arxiv.org/pdf/2305.01260.pdf
- Patent pending, PCT/EP2024/060565

Background

Wireless communication systems are inherently vulnerable to interference and jamming attacks. Multi-antenna processing mitigates jamming attacks through receive beamforming, which forms a spatial filter. In contrast to traditional defense techniques like direct-sequence spread spectrum (DSSS) or frequency-hopping spread spectrum (FHSS), spatial filtering withstands even strong interference. To construct such a spatial filter, however, the receiver needs to know the spatial signature of a jammer. Estimating this signature is easy for non-smart barrage jammers but has been an open problem for more sophisticated smart jammers i.e. protocol-aware and reactive jammers.

Invention

This invention defends multi-antenna receivers against all types of jammers including smart jammers. The transmitter performs a secret linear operation (in the time domain) on the signals to be transmitted. The receiver performs the inverse of this secret linear operation (which is also a linear operation in the time domain) on the receive data. This inverse operation transforms all jammers into static, non-smart jammers. It is then easy to estimate the spatial signature of any jammer in this transform space. With this knowledge, the multi-antenna receiver constructs a spatial filter that blocks the jammer interference. The secrecy of the respective transforms is ensured by a pre-shared secret key between transmitter and receiver.

Simulative experiments in MATLAB have proven the method.

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Reference 2022-116

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Technology Readiness Level

1 2 **3** 4 5 6 7 8 9