Chair of Theoretical Information Technology
Department of Electrical and Computer Engineering
Technical University of Munich

Munich, July 2023

Bachelor / Master Thesis

Secret Key Generation From Wireless Channels Using Software-Defined Radios

Secret key generation from wireless channels is a promising approach to enable secure communication without explicitly distributing keys. In this approach, the randomness of the wireless channel and its reciprocity, are exploited to derive a secret key at both communication partners. Subsequently, this key can be used to symmetrically encrypt the data.

In this thesis, software-defined radios (SDRs) USRP X310 will be used to probe the channel. To this end an experimental setup will be devised, software for the SDRs will be written (MATLAB or GNU Radio), and data will be collected. In a next step, the channel measurement data will be analyzed regarding their suitability for generating the keys. Further, key parameters (bandwidth, quantization scheme, etc.) will be optimized to maximize the key length, while maintaining robustness.

Description:

- Implement an OFDM-conform flexible channel estimation using SDRs
- Perform measurements to collect channel transfer functions (indoor static and dynamic scenarios)
- Study channel reciprocity, robustness, optimize optimal sampling in time and frequency
- Apply signal processing techniques and information theoretical methods to process the data

Your qualifications:

- Knowledge of mobile communications, signal processing
- Experience with software defined radios
- Programming experience in MATLAB, Python, or LabVIEW
- Goal-oriented and structured work style

To apply:

Please send your application by e-mail to Ullrich Mönich (moenich@tum.de with the subject "Thesis: KEYGEN"), including the following documents:

- Curriculum vitae
- Academic transcript
- Short motivation (0.5 - 1 page)

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