Winter School: New radio access techniques enabling advanced video applications in 5G

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ESR 2

New Transmitter and Receiver Algorithms for mMIMO with Limited CSI

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Objectives

Design algorithms for transmission and reception in massive MIMO systems where there is little or no Channel State Information (CSI) in the transmitter or receiver side. They will be optimized to increase the spectral efficiency in a given cell even with low SNR.

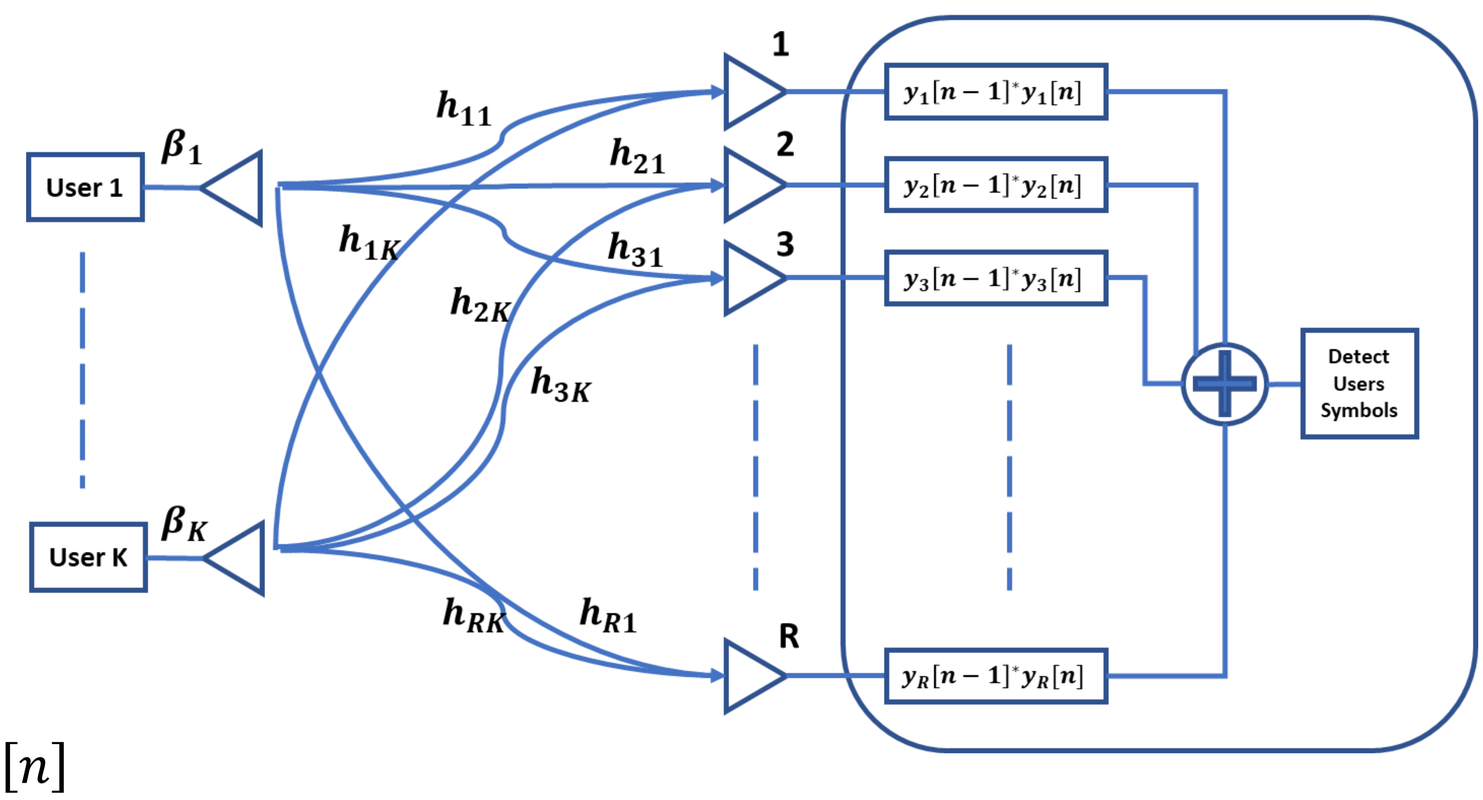
Expected Results

New algorithms to increase the capacity and energy efficiency of future networks where small base stations may be equipped with a very large number of antennas. The performance will be analyzed by link-level simulations and a selected set of techniques will be prototyped.

Ideas, Concepts and Results

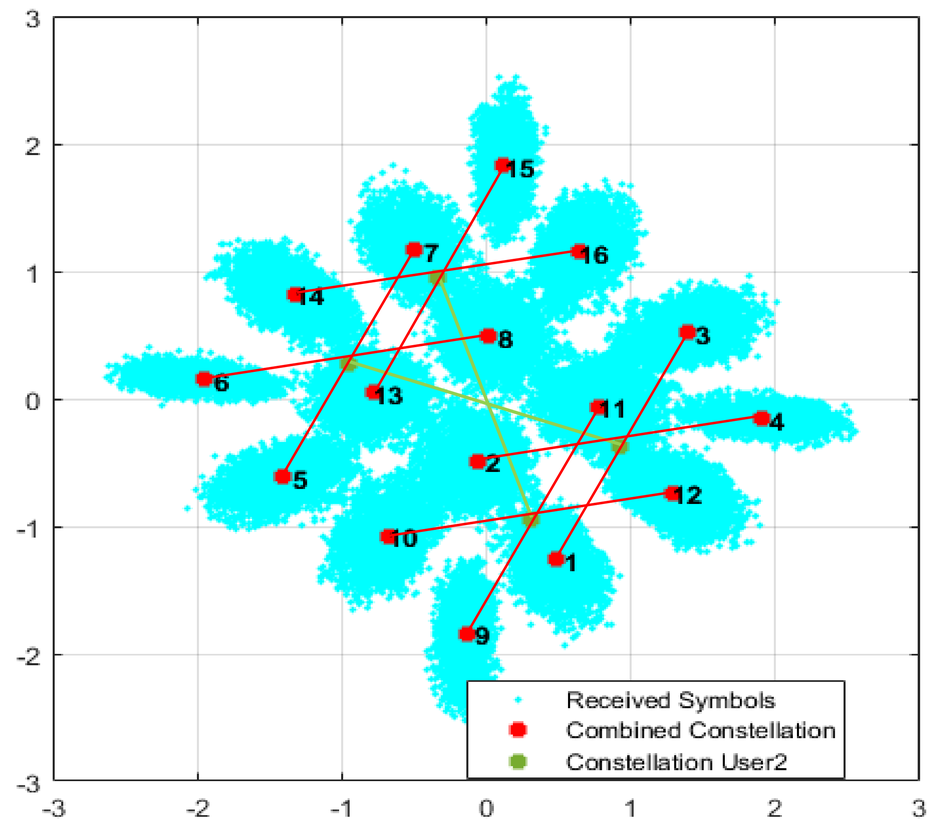
Non-coherent Massive MIMO

- Differential Encoding → $x_j[n] = x_j[n-1]s_j[n]$
- Received signal → $\boldsymbol{y} = \boldsymbol{H\beta x} + \boldsymbol{v}$
- Received signal → $z[n] = \frac{1}{R}\sum_{i=1}^{R} y_i[n-1]^* y_i[n]$
- Combined Constellation → $\zeta[n] = \sum_{j=1}^{K} \beta_j s_j[n]$
- Received signal → $z[n] = \zeta[n]$ + noise & distortion terms
- Decision → $\hat{\zeta}[n] = \arg\min\{|z[n] - \hat{\zeta}[n]|\}$



Optimize Individual Constellations to Max/Min some Goal

- Variable Parameters → Constellation distributions of users
- Optimize through Heuristic Optimization
- Optimize total BER of users
- TO DO:
  - Understand why these constellations
  - Try Machine Learning techniques



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