

Efficient signal processing for mobile OFDMA

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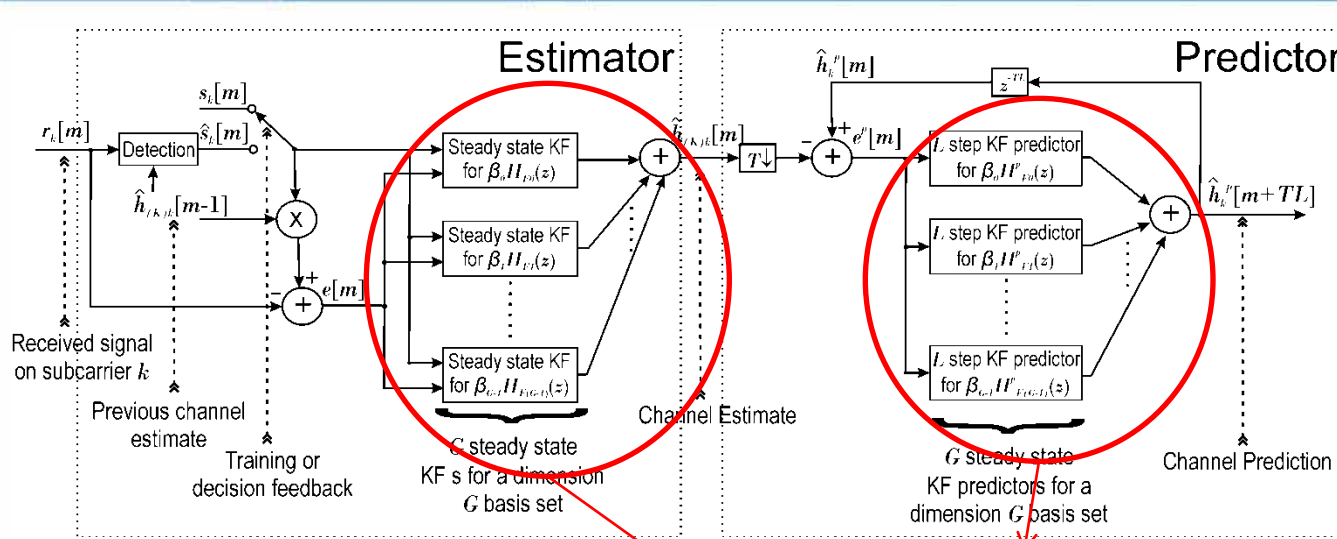
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Main research lines:

- Low complexity channel estimation/prediction
 - Parametric-statistical approach
- Efficient resource allocation
 - Practical physical layer impairments considerations

Low complexity channel estimation/prediction

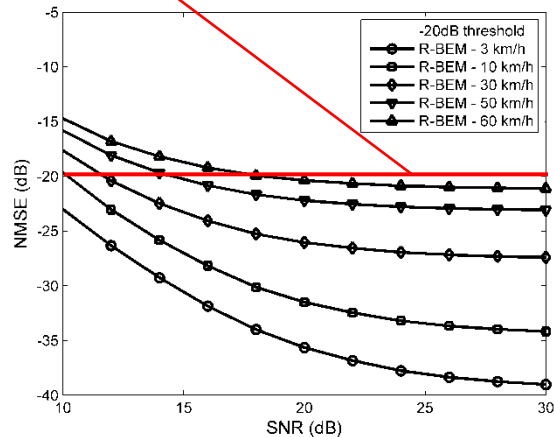
- Mobile stations require accurate low complexity channel tracking solutions
 - Low computational power
 - Long battery autonomy
- Resource allocation for mobile OFDMA requires reliable channel predictions
 - Compensate feedback delay
 - Improve fairness with prediction based resource allocation
- DCT has gained attention as a signal processing tool for mobile scenarios
 - Recursive DCT approximation combined with Kalman filter provides robust channel estimation prediction at a low computational cost



Over 60%
computational saving
compared to classical
Kalman and sum of
sinusoids
formulations

Performance threshold

Recursive DCT - Kalman formulation

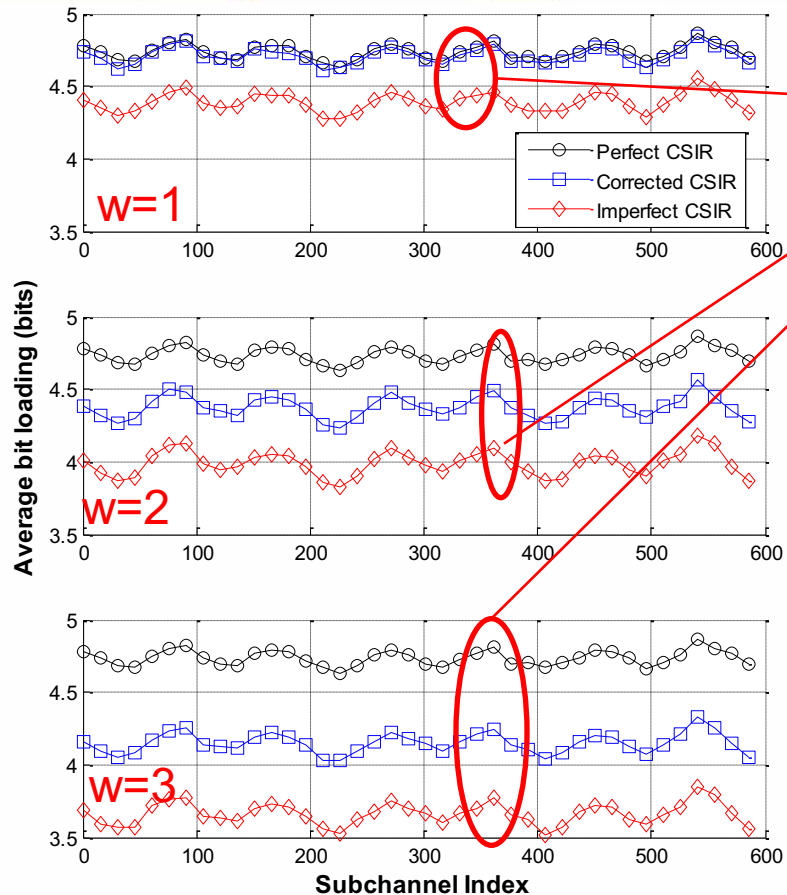


Good performance up to vehicular speed for moderate to high SNR

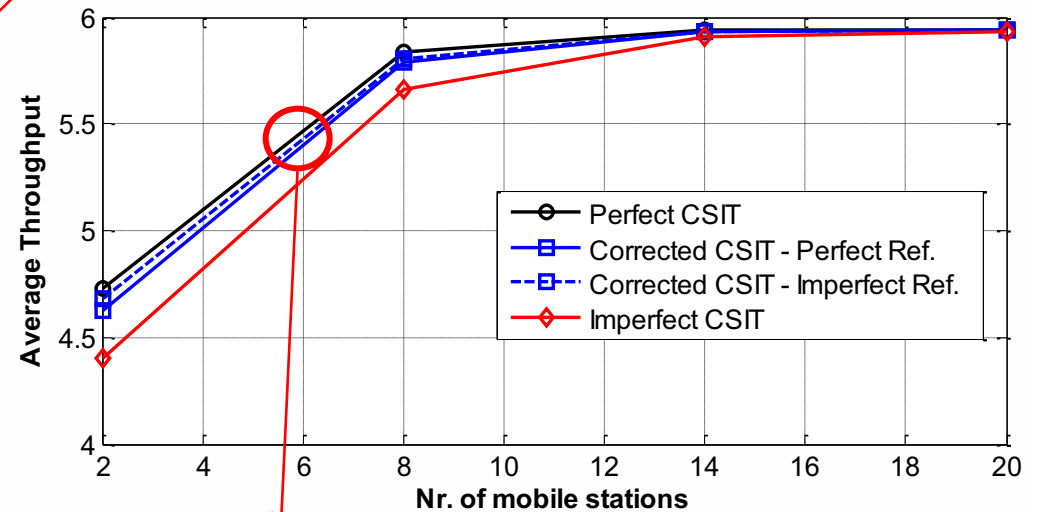
- J. Schmidt, J. Cousseau, R. Wichman and F. Gregorio, "Fast fading channel estimator using DCT and simplified Kalman filter", IEEE SPAWC 2007.
- J. Schmidt, J. Cousseau, R. Wichman and S. Werner, "Low-complexity channel prediction using approximated recursive DCT". To be published IEEE Trans. Circuits and Systems 1, 2011.

Efficient resource allocation

- Mobile cellular systems allocate resources in a time slot basis
 - Rapidly varying channel conditions
 - Feedback delay for CSIT acquisition must be compensated
 - Low complexity reliable channel prediction is required
- Prediction based resource allocation was shown to improve fairness among users
 - Prediction error in this scenario cannot be neglected
 - Proper characterization/compensation of prediction error is needed
- General statistical characterization is desirable
 - Applicability to general long range channel predictors
 - OFDM provides many samples of prediction error
 - Histogram approach for prediction error characterization



- Bit loading degradation as prediction horizon increases.
- Prediction error evenly distributed among system subcarriers



Effective reduction on total system throughput degradation

- J. Schmidt, J. Cousseau, R. Wichman and S. Werner, "Prediction based resource allocation in OFDMA", CISS 2011, John Hopkins University.
- J. Schmidt, J. Cousseau, R. Wichman and S. Werner, "Bit loading using imperfect CSIT for prediction based resource allocation in mobile OFDMA". Under revision for publication in IEEE Trans. Vehicular Technologies.