Introduction to large MIMO

Introduction to support vector regression

In this report we construct a prototype of a complexity & performance controllable detector for large MIMO based on dual channel complex SVR, by employing Wirtinger's caculus to complex Reproducing Kernel Hilbert Space (RKHS). The detector can be divided into two parallel real SVR optimization problem which can be solved independently. Moreover, only real part of kernel matrix is needed in both channel. This means a large amount of computation can be reduced.

Based on the discrete time MIMO channel model, In our regression model, this CSVR-detector is constructed without offset, The offset in SVR imposes an additional linear quality constraint, which makes it necessary for decomposition methods such as Sequential Minimal Optimization to update more than one Lagrange multipliers in each iteration.

Therefore, for each real SVR without offset, in principle, only one offset is needed to be updated in each iteration, however [ref SVR without offset] shows with a proper designed work set selection strategy, the approach that choosing double Lagrange multipliers can be much more faster than choosing single Lagrange multiplier without performance loss.

In our prototype, we propose a sequential single Lagrange multiplier search strategy that find two Lagrange multiplier sequentially, which can approximate the optimal dual Lagrange multiplier searching strategy. However the former one only requires O(n) searches in one iteration, while the optimal dual Lagrange multiplier strategy requires O(n2) searches per iteration.