

Directional intra prediction plays an important role in current state-of-the-art video coding standards. In directional prediction, neighbouring samples are projected along a specific direction to predict a block of samples. Ultimately, each prediction mode can be regarded as a set of very simple linear predictors, a different one for each pixel of a block. Therefore, a natural question that arises is whether one could use the theory of linear prediction in order to generate intra prediction modes that provide increased coding efficiency. However, such an interpretation of each directional mode as a set of linear predictors is too poor to provide useful insights for their design. In this paper, we introduce an interpretation of directional prediction as a particular case of linear prediction, which uses the first-order linear filters and a set of geometric transformations. This interpretation motivated the proposal of a generalized intra prediction framework, whereby the first-order linear filters are replaced by adaptive linear filters with sparsity constraints. In this context, we investigate the use of efficient sparse linear models, adaptively estimated for each block through the use of different algorithms, such as matching pursuit, least angle regression, least absolute shrinkage and selection operator, or elastic net. The proposed intra prediction framework was implemented and evaluated within the state-of-the-art high efficiency video coding standard. Experiments demonstrated the advantage of this predictive solution, mainly in the presence of images with complex features and textured areas, achieving higher average bitrate savings than other related sparse representation methods proposed in the literature.