

## ABSTRACT

The main idea of the thesis is to design an efficient tracking algorithm that is able to track moving objects in presence of spatial illumination variation. The state vectors constitute of the motion parameters and the illumination vectors. The illumination vector is designed as a sparse vector using the fact that the scene parameters (e.g. illumination) at any given instant, can have a sparse representation with respect to the basis i.e. only a few basis elements will contribute to the scene dynamics at each instant. The observation is the entire image frame. The non-linearity and the multimodality of the state-space necessitates the use of Particle Filter. The illumination vector along with motion makes the state-space large dimensional thus making the implementation of regular particle filter expensive. PF-MT has been designed to tackle this problem but it does not utilise the sparsity constraint and hence fails to detect the sparse illumination vector. So we design an algorithm that would use particle filter and importance sample on the motion or the 'effective space' and the mode tracking step of PF-MT is replaced by the Modified Compressed Sensing for estimating the 'residual space'. Simulation and also experiments with real video demonstrate the advantage of the proposed algorithm over other existing PF based algorithms.