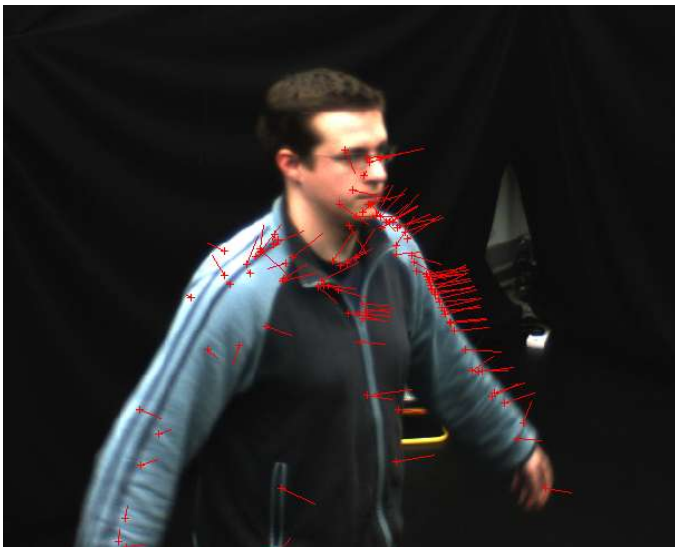
Detection and tracking of ‘key scene features’ as a prior for estimating the dynamic geometry for free-view point video applications

'Free-viewpoint video' allows viewers to watch a dynamic scene from any angle and has real-world applications in areas such as TV sports coverage and film production. In a football or rugby match, 'free-viewpoint video' would allow viewers to see the action from any position on the pitch, including the view seen by the goalkeeper or referee. 'Free-viewpoint video' would enable greater flexibility during film production by allowing directors to choose the movement of the camera even after the filming of the scene has taken place.

In order to provide 'free-viewpoint video', the geometry of the scene must be estimated from cameras positioned at multiple viewpoints. Estimating the scene geometry at each time point is difficult because the input cameras only provide partial information about the surfaces present within the scene. Current techniques provide an independent estimation of the scene's geometry at each point in time and disregard information received at previous time points. The goal of this work is to investigate techniques which estimate the geometry of the scene using information available from all previous time points. The approach currently being investigated is the robust detection and tracking of key scene features, to be used as a stable basis for estimating the detailed geometry of the scene at each time point.



When an image feature can be detected in several camera views and over several time points, then it may be considered as a 'key scene feature'. As well as having a 3d location, both the surface texture and orientation of the key scene feature are estimated, so that the appearance of the feature can be reliably predicted from any viewpoint. Early results show that the locations and surface normal vectors of the key scene features can be reliably estimated but that the current tracking methods are only partially successful. Future research will focus on: improving the tracking accuracy; clustering the key scene features into groups with coherent motion; and investigating how the key scene features should be used as a prior for estimating the detailed geometry of the scene.