

## A Novel Automated Method for 3D Reconstruction using RGB/IR Image Sequences from Multi-modal Cameras

In recent years, the use of multi-modal camera rigs consisting of an RGB sensor and an infrared (IR) sensor have become increasingly popular for use in surveillance and robotics applications. The advantages of using multi-modal camera rigs include improved foreground/background segmentation, wider range of lighting conditions under which the system works, and richer information (e.g. visible light and heat signature) for target identification. However, the traditional computer vision method of mapping pairs of images using pixel intensities or image features is often not possible with an RGB/IR image pair.

We introduce a novel method to overcome the lack of common features in RGB/IR image pairs by using a variational methods optimization algorithm to map the optical flow fields. While RGB/IR image pairs often do not have similar visual characteristics, they do produce similar flow fields. Our method finds the alignment between the flow fields acquired by the RGB/IR camera pair. The resulting flow field alignment produces correspondences similar to those found in a stereo RGB camera rig using pixel intensities or image features. These correspondences are used to generate dense disparity maps which in turn are converted into a dense depth map. We obtain accuracies similar to methods that align pairs of RGB images using image features or pixel intensities.

We test our method on synthetic optical flow fields and on real image sequences taken with a traditional multi-modal binocular stereo RGB/IR camera rig. We demonstrate our method's accuracy by comparing against a precision ground truth.