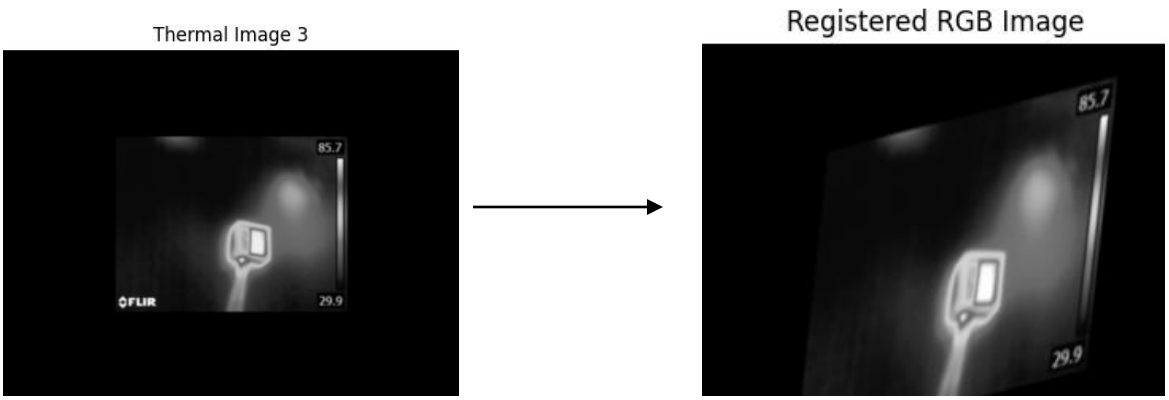
Image Registration

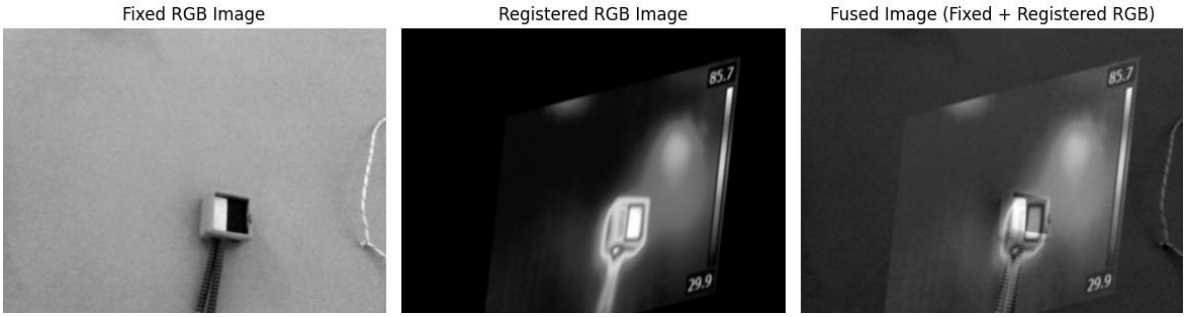


The code implemented in the GitHub repository enabled an effective registration of thermal and RGB images obtained under controlled conditions, ensuring accurate alignment between them. The approach utilized is based on the Mattes Mutual Information image registration algorithm, which is well-suited for multimodal images, such as thermal and RGB, due to its ability to maximize intensity correspondence between the two image modalities.

The registration method was configured using a multi-resolution scheme, applying Gaussian pyramids to enhance the efficiency of the process and allow for faster convergence, especially in high-resolution images. Additionally, a OnePlusOneEvolutionary optimizer was employed to fine-tune the affine transformation parameters, ensuring greater precision in image alignment.

It is important to note that the configuration used is specifically designed for this particular experiment under controlled image acquisition conditions. Therefore, its applicability to other contexts or different types of images may require additional adjustments to the registration parameters. The registration effectiveness has been validated within the established experimental environment, ensuring that the results obtained are precise and reproducible within the current conditions.

Image Fusion



The fusion of images was successfully achieved by first resizing the resampled registered RGB image to match the dimensions of the fixed image. This ensured proper alignment before applying the fusion process. Using OpenCV's `cv2.addWeighted` function, the two images—fixed and resampled—were blended with equal weighting (0.5 for each), which resulted in a seamless combination of both image modalities.

The resulting fused image provides a clear representation of both the fixed RGB image and the registered RGB image, illustrating the accurate registration achieved through the algorithm. The visual comparison shows that the fixed and registered images are well-aligned, confirming that the registration process has been effective. The fusion process further enhances this alignment, offering a combined view that highlights the advantages of both thermal and RGB images.

The results demonstrate that, within the controlled conditions of the experiment, the image fusion produces high-quality outcomes, where the images are in precise alignment and well-positioned for further analysis. This approach is suitable for the specific experimental setup, and its effectiveness in visualizing the correspondence between the two image types is evident in the fused result.