Image Alignment using Harris Corner Detection

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1 Introduction

Image alignment is a common machine vision task, which involves combining two image into a single image. There are number of algorithms that can be used for this, falling into two categories, intensity-based, and feature-based. The algorithm that will be used in this project is feature-based, using the features common to both images to align them. To find these features, Harris corner detection was used.

2 Methodology

As mentioned the algorithm used to align the features that are common to both images. This algorithm can be broken down into 3 main steps;

1. **Feature detection:** For a feature to be useful for this task it must be unique within the image, i.e. features such as edges are not of much use for alignment. This meant finding regions of high local variance, such as corners. Harris corner detection is a good method for finding these points, and is what was used for this project.

2. **Feature matching:** The next step is to form pairs these Harris interest points found in each image. This is done by taking a patch around each interest point and creating pairs based of the most similar patches.

3. **Translation:** The last step is to find the best translation to align the images. This is commonly done using a RANSAC search to find the an appropriate translation without checking all combinations of points. However, as there is a small (¡300) number of points an exhaustive search can be done to find the 'best' translation.

Using these steps the sample image pairs were able to be aligned. However these were very *clean* images, and not very representative of a real world image alignment task. For this reason the effect small rotations and scaling of one of the images had on the alignment process was looked at.

3 Harris Corner Detection