

# Visual Odometry Pipeline

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## Symbols

# Contents

<b>1</b>	<b>Introduction</b>	<b>4</b>
<b>2</b>	<b>Implementation</b>	<b>5</b>
2.1	Framework . . . . .	5
2.1.1	Coordinate Frames . . . . .	5
2.1.2	Pipeline overview . . . . .	5
2.1.3	Options and parameters . . . . .	5
2.2	Initialization . . . . .	5
2.3	Continuous Operation . . . . .	8
<b>3</b>	<b>Results</b>	<b>10</b>
3.1	Overall performance . . . . .	10
<b>4</b>	<b>Discussion</b>	<b>11</b>
<b>5</b>	<b>Conclusion</b>	<b>11</b>

## Introduction

The aim of this mini project is the development of a visual odometry pipeline. This pipeline takes the consecutive gray-scale images of a single digital camera as input. Therefore the pipeline developed in this mini project is a monocular visual odometry pipeline.

The output of the pipeline is the position of the camera in relation to its initial position for each frame.

keywords: (VO, sequential, monocular, markov assumption)

# Implementation

## Framework

This pipeline was developed in MATLAB. Since the group consists of four students, a Git repository was used to be able to work on different files simultaneously, and to enable version control. (keywords: MATLAB, Git)

## Coordinate Frames

In this mini project the coordinate frames were defined as shown in fig. 1. The camera coordinates are in a way oriented, that the x-y plane lies parallel to the image plane, while the z-axis is pointing towards the scenery. The world frame however is oriented in such a way that the x-y plane is parallel to the ground and the z-axis is pointing upwards.

The origin of the world frame is at the same location as the origin of the first boot-strap image.

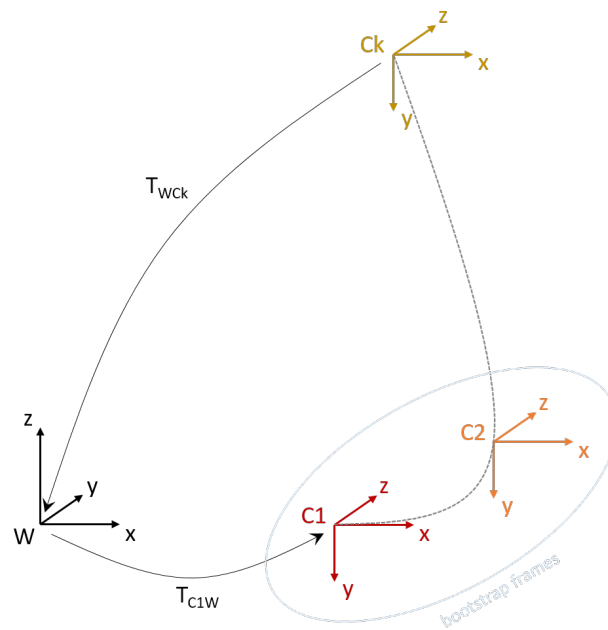


Figure 1: Coordinate Frames

## Pipeline overview

As shown in fig. 2 the pipeline consists mainly of three parts, a bootstrap, the initialisation and the continuous operation. In section 2.2 and section 2.3 the initialisation and the continuous operation are described in detail.

## Options and parameters

(keywords: parameter handling, GUI)

## Initialization

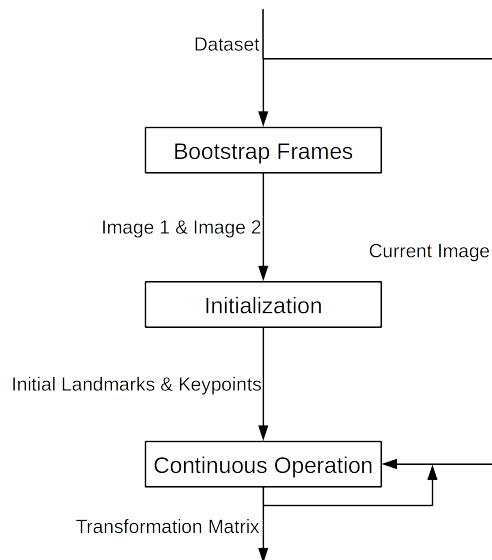


Figure 2: Rough Flow chart

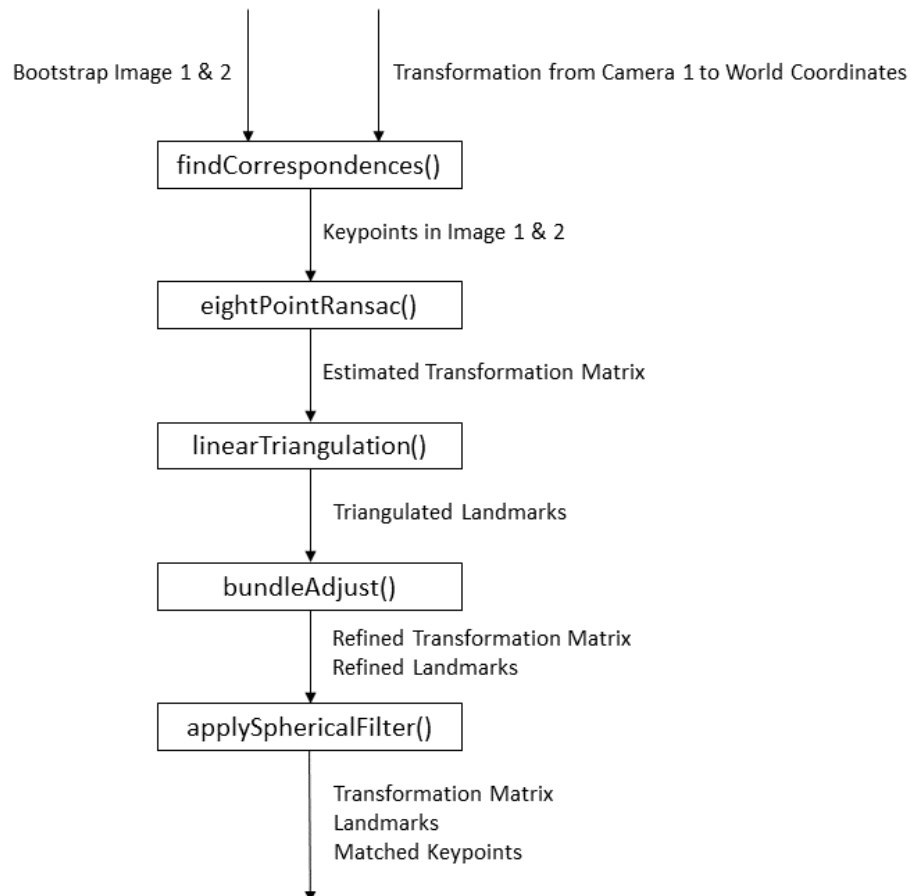


Figure 3: Init Flow chart

## **Continuous Operation**



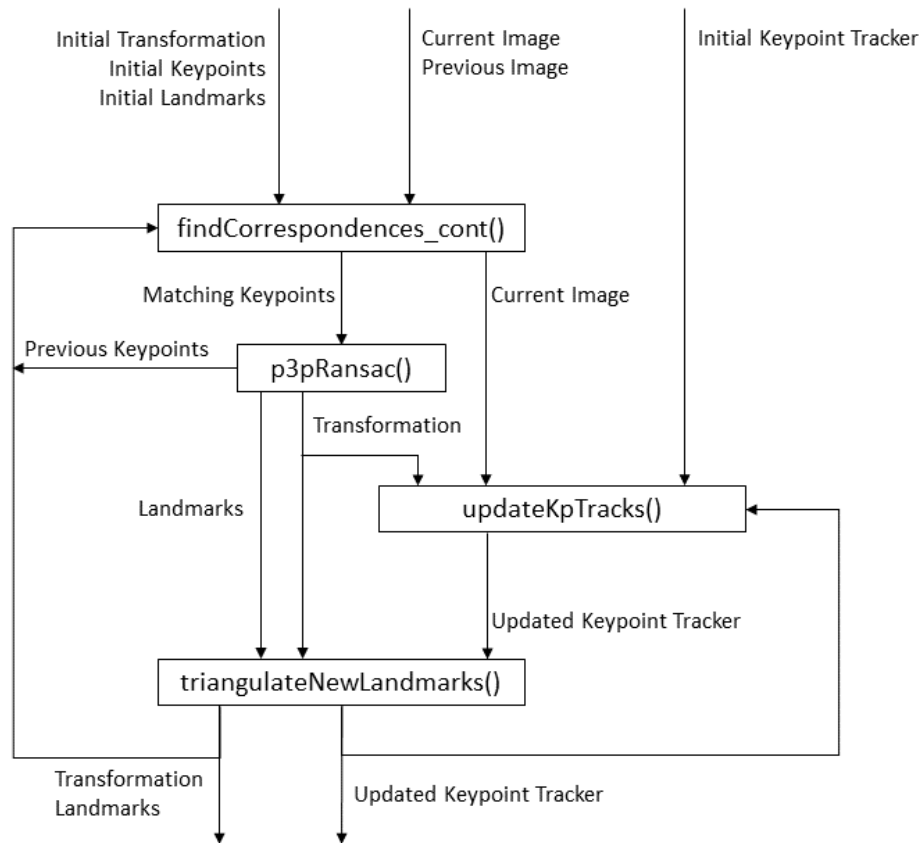


Figure 4: Cont Flow chart

## Results

### Overall performance

(keywords: Real time ness, comparison to groundtruth, compare different datasets Impact of features)

## Discussion

What have we learned, what worked?

Possible future work, improvements (loop closure, ...)

## Conclusion