FRIEDRICH-ALEXANDER
UNIVERSITÄT
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TECHNISCHE FAKULTÄT

Status Masterarbeit

Themen

- Kalibrierung (Priorität, RANSAC)
- Registration
- Gliederung Arbeit
- Titel Arbeit
  - “Deep Learning in Laryngological Stereo Endoscopy”
- Zeitplan

RANSAC

The *random sample consensus* is a paradigm for model fitting, which takes the presence of outliers in the underlying data set into account. It was first proposed by [6] and has since then widely been used [2nd source]. Outliers, which are points in the data set, are present if either

- their location deviates significantly from the ground truth, or
- their correspondence to a subset of the data set is wrong.

Why does this apply to our case -> explanation
Why can we not simply remove outliers -> explanation

RANSAC

The RANSAC can be described as an algorithm that follows the steps:

1. Draw samples uniformly and at random from the input data set.
2. Cardinality of sample set is the smallest size sufficient to estimate the model parameters.
3. Compute the model parameters for each element of the sample data.
4. Evaluate the quality of the hypothetical models on the full data set.
   - Cost function for the evaluation of the quality of the model
   - Inliers: data points which agree with the model within an error tolerance
5. The hypothesis which gets the most support from the data set is taken as the best estimate.

- precise = false -> 2 points of 2 rays (4 points)
- precise = true -> 2 points of 2 rays (4 points) + 1 point of each left over ray

Previously: Approximation
Now: Interpolation with support

probability outlier free desired

number of samples

$$n = \frac{\log(1-p)}{\log(1-(1-\epsilon)^s)}$$

sample size

probability outlier present

Registration

The goal of image registration is to find a spatial transform for a *source image* such that the highest similarity to a *reference image* is achieved. The measure of similarity between two images can be described with an objective function, which is then optimized. In [**?**] the first couple of chapters profoundly explain image registration. Concluding from this work, image registration has a strong presence in medical image processing. Amongst other problems it is used to

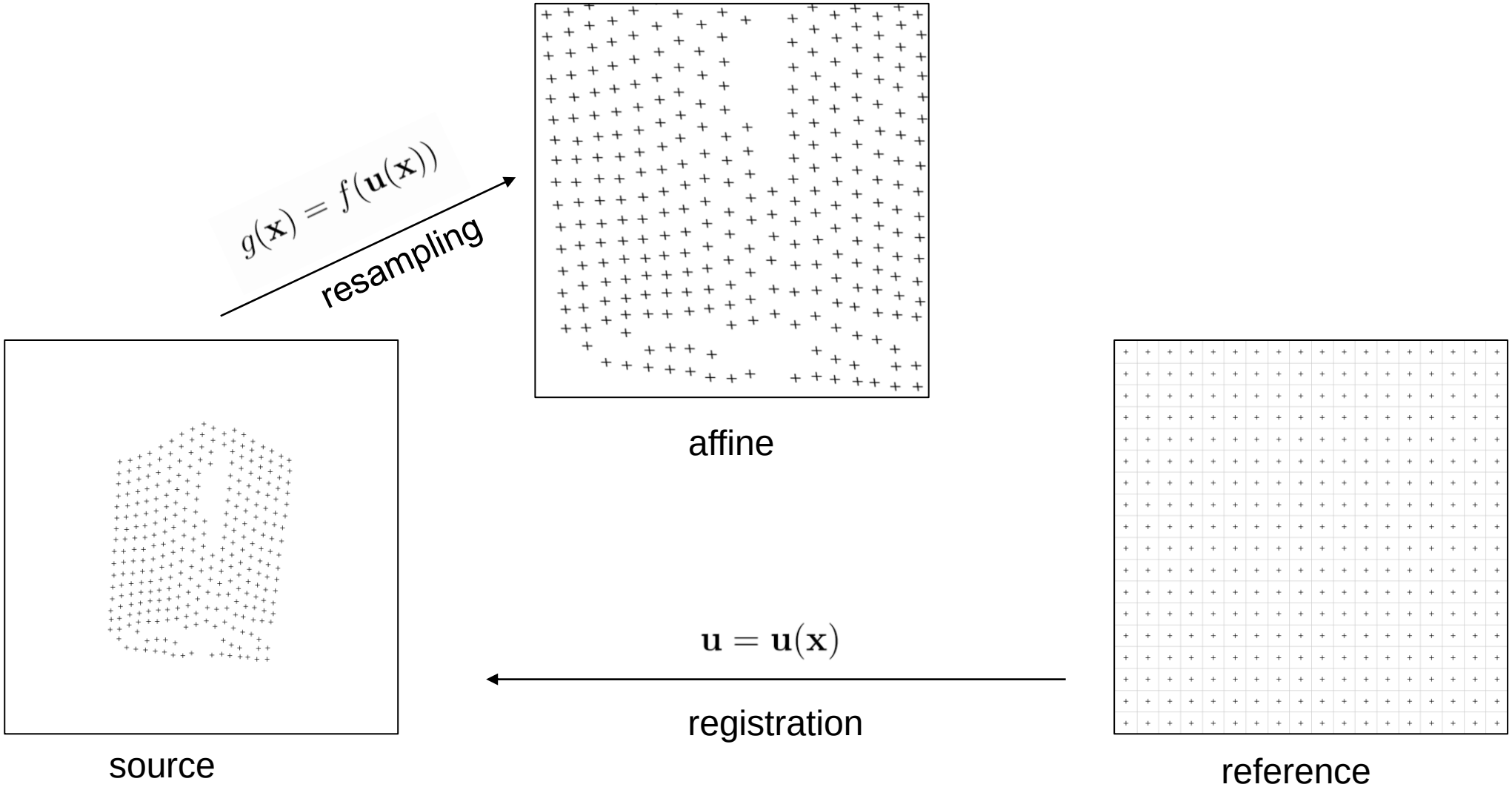
- assist in image segmentation,
- overlay preprocessed data from brain atlases,
- match functional and anatomical images to localize for example brain activity in $^{1}fMRI$ or metastasis in $^{2}PET/CT$,
- identify long term shape changes in brain tissue or to
- perform spatial normalization.

Registration

1. *within-modalities* where images have a linear relation between their intensities or
2. *between-modalities* where no relation between images' intensities is present.

1. *label-based* or
2. *intensity-based*

Linear Registration



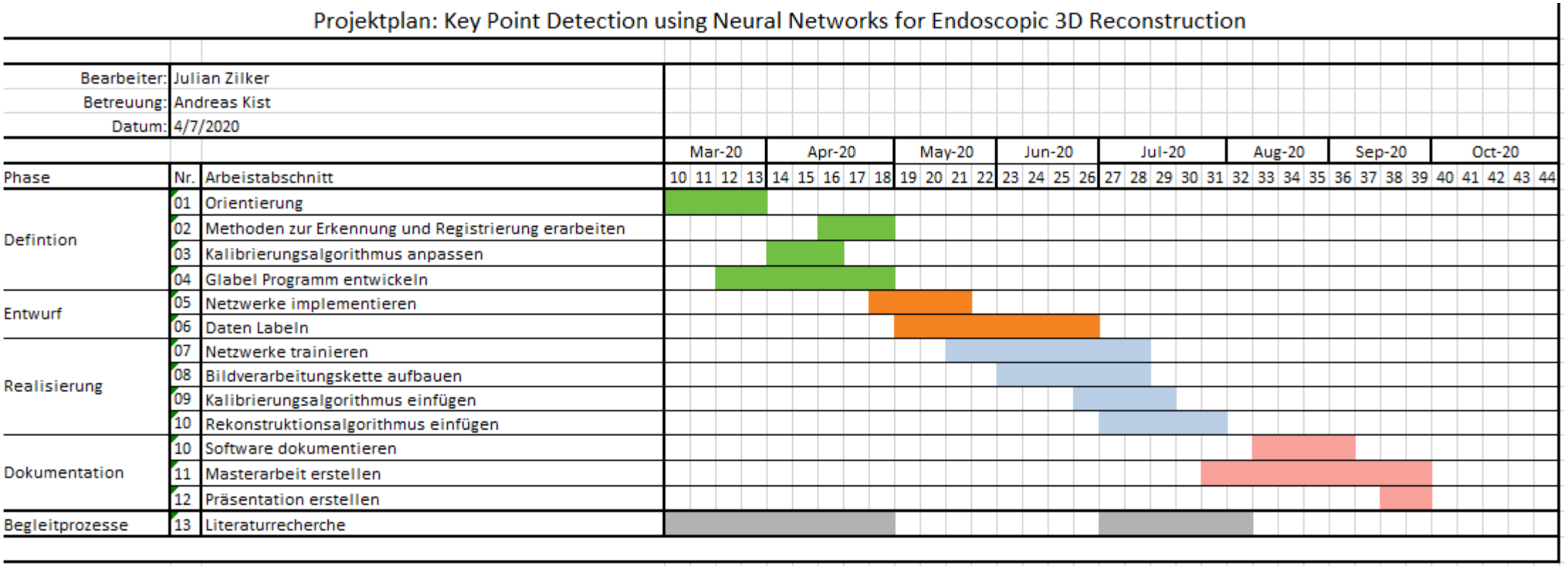
Non-Linear Registration

1. linear or
2. non-linear

$$\mathbf{y}(\mathbf{x}_i, \boldsymbol{\alpha}) = \sum_{m=1}^{M} \alpha_m \boldsymbol{\phi}_m(\mathbf{x}_i)$$

1. small or
2. large

Zeitplan


Projektplan: Key Point Detection using Neural Networks for Endoscopic 3D Reconstruction
Bearbeiter: Julian Zilker
Betreuung: Andreas Kist
Datum: 4/7/2020
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
Phase
Nr.
Arbeistabschnitt
Defintion
01 Orientierung
02 Methoden zur Erkennung und Registrierung erarbeiten
03 Kalibrierungsalgorithmus anpassen
04 Glabel Programm entwickeln
Entwurf
05 Netzwerke implementieren
06 Daten Labeln
Realisierung
07 Netzwerke trainieren
08 Bildverarbeitungskette aufbauen
09 Kalibrierungsalgorithmus einfügen
10 Rekonstruktionsalgorithmus einfügen
Dokumentation
10 Software dokumentieren
11 Masterarbeit erstellen
12 Präsentation erstellen
Begleitprozesse
13 Literaturrecherche