

ACTIVITIES AT IMID

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ÚSTAV
KONSTRUOVÁNÍ

CONTENTS

- Introduction
- Dissertation thesis
- Academic activities
- Projects and other activities



ŽDAS forge

INTRODUCTION

- Second year PhD student
- Department of Reverse Engineering and Additive Technologies
- Supervisor: assoc. prof. David Paloušek
- PhD thesis: Measurement of dimensions and shape of forgings



DISSERTATION THESIS

INTRODUCTION

- Focused on open-die forging
- Heavy forgings
- On-line measurement in demand
- Axis straightness, diameter, length
- Specific conditions – large field, heavy industry



Heavy forging
(simufact.com)

DISSERTATION THESIS



Forging length
measurement

DISSERTATION THESIS



Hot forging axis
straightness measurement

DISSERTATION THESIS



Cold forging axis
straightness measurement

DISSERTATION THESIS



Cold forging axis
straightness measurement

DISSERTATION THESIS



Cold forging axis
straightness measurement

DISSERTATION THESIS

INTRODUCTION

- Savings up to 15 % of material
- Easier machining
- Cooperation with ŽĎAS
- Axis straightness, diameter



Heavy forging
(simufact.com)

DISSERTATION THESIS

RESEARCH

- Potential of passive photogrammetry
- Lack of information
 - Acquisition method
 - Calibration method
 - Segmentation
 - 3D reconstruction using silhouettes
 - Image matching
- Never verified in industrial conditions



DISSERTATION THESIS

RESEARCH

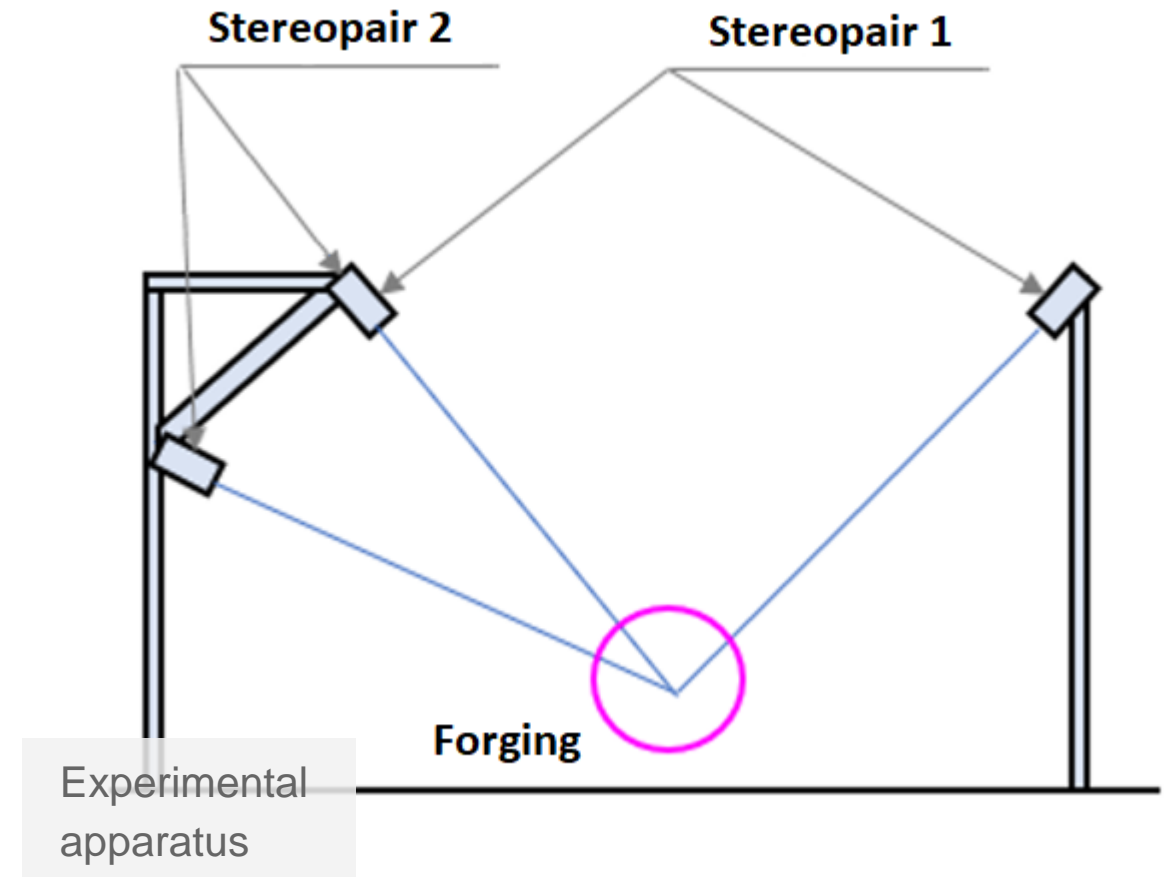
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DISSERTATION THESIS

EXPERIMENTAL APPARATUS

- 2 stereopairs with different bases
- 16 MPx astronomical cameras
- Zeiss objectives
- Thermoregulated camera covers



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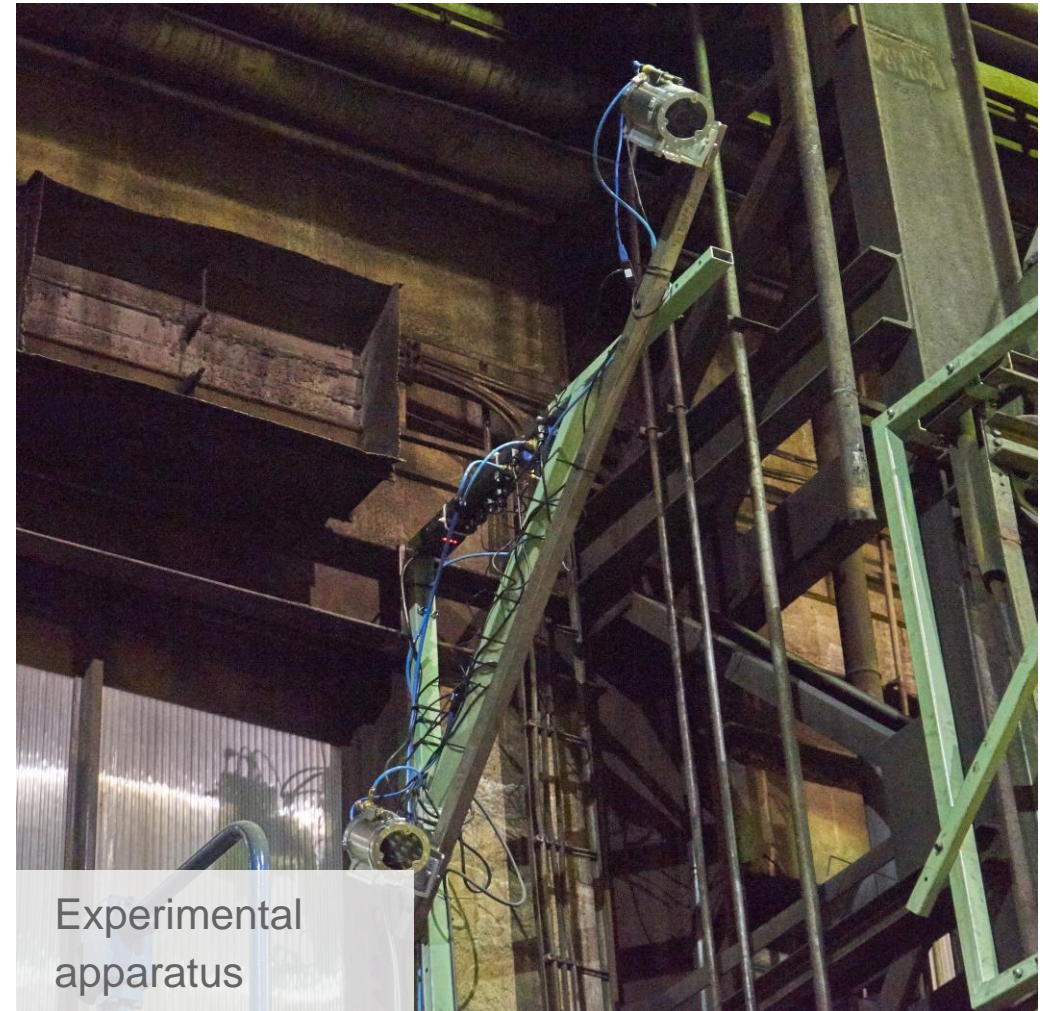


Thermoregulated
camera cover

DISSERTATION THESIS

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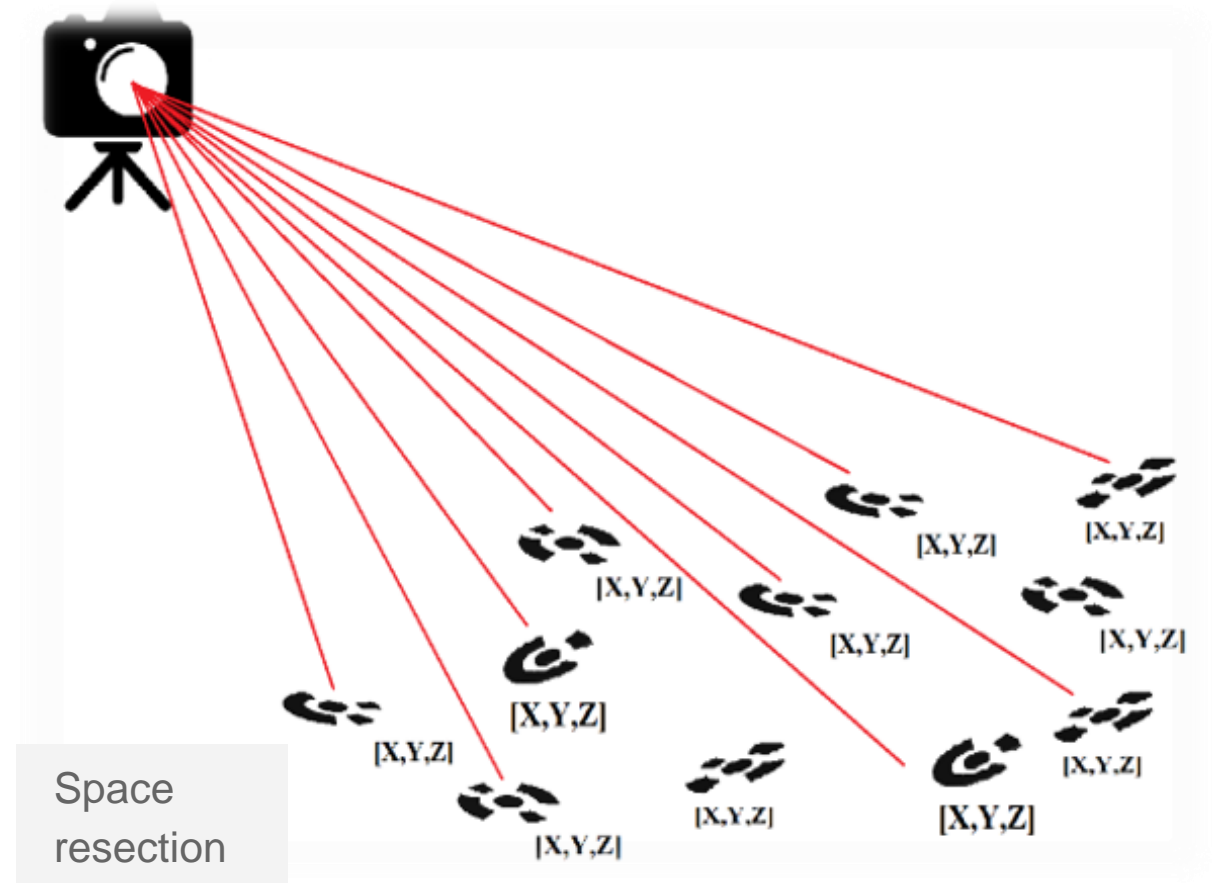


Experimental apparatus

DISSERTATION THESIS

CAMERA CALIBRATION

- Based on space resection
- Unique marker library generation and recognition algorithm (**journal article**)
- Two-step solution – intrinsic and extrinsic parameters calibration (**conference**)



DISSERTATION THESIS

CAMERA CALIBRATION

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DISSERTATION THESIS

CAMERA CALIBRATION

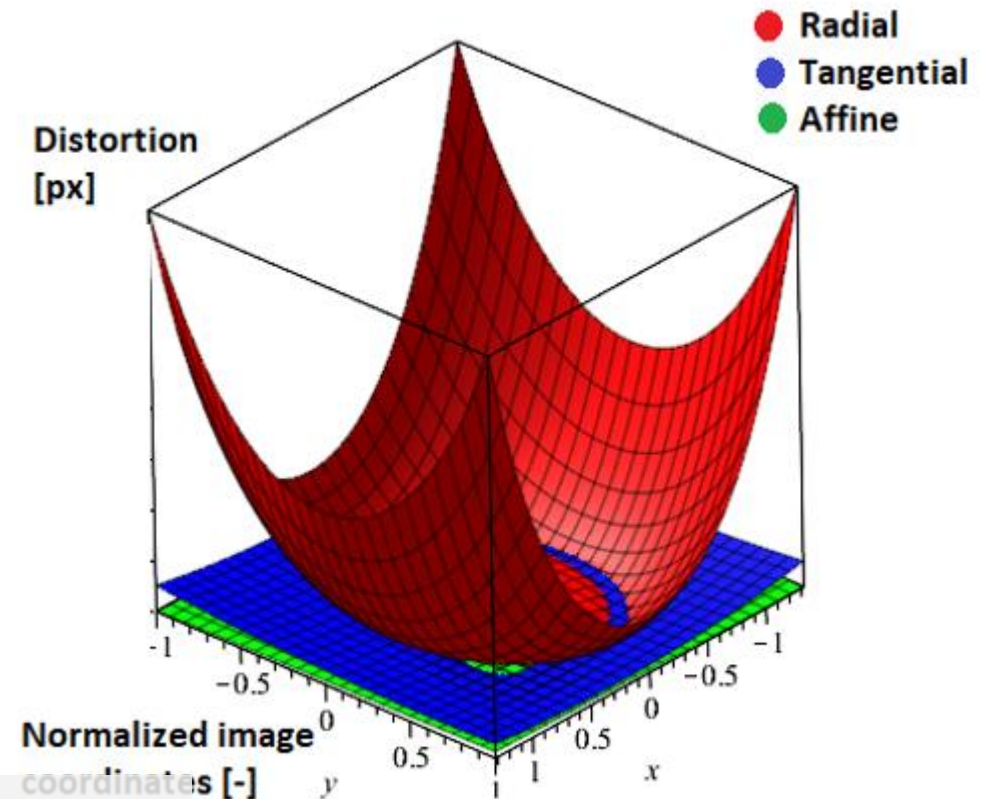
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DISSERTATION THESIS

CAMERA CALIBRATION

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Camera distortion
model

DISSERTATION THESIS

EXPERIMENTS

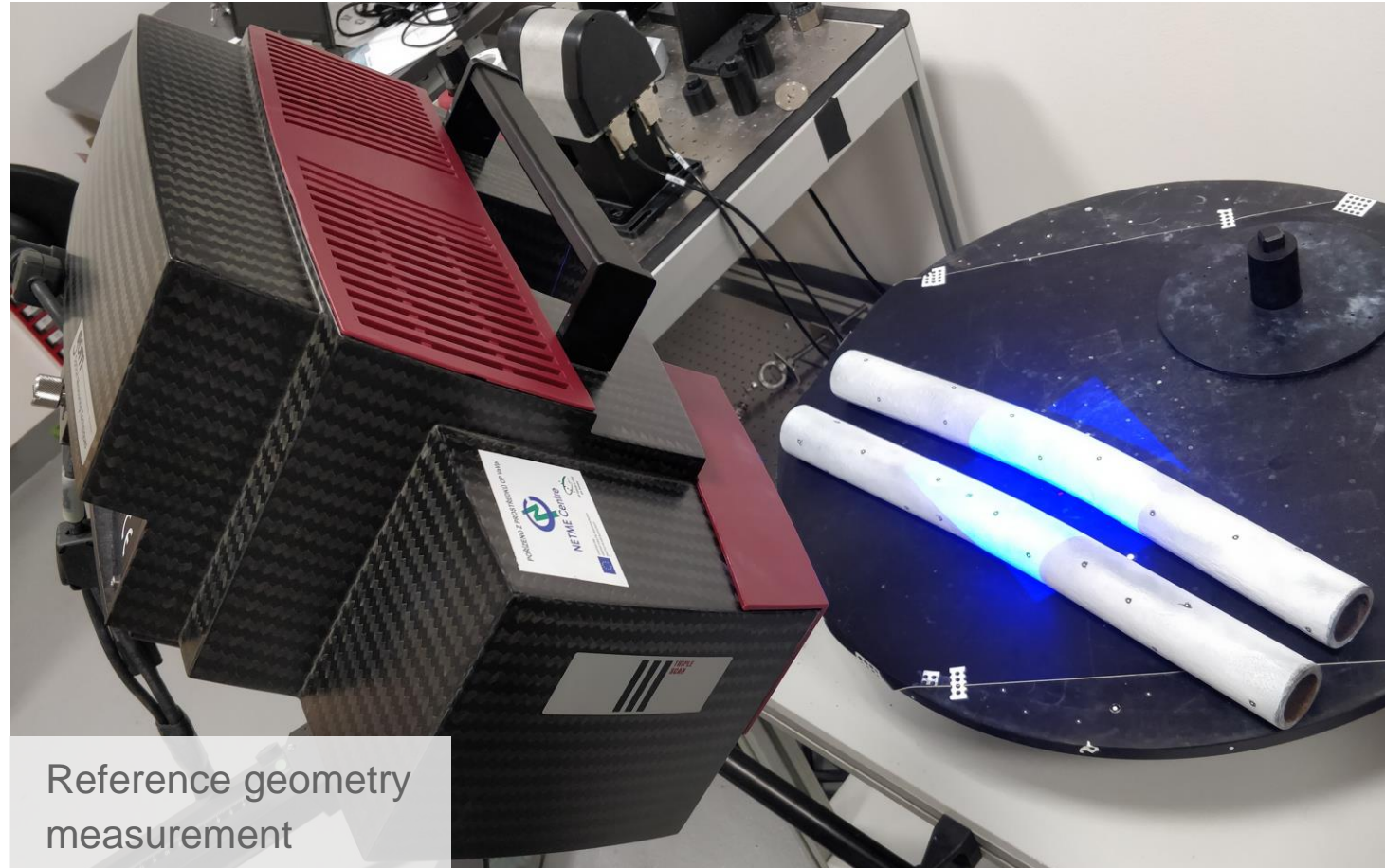
- Experiments in laboratory
 - Preparation, different scale
 - 3D scan as reference
- Experiments in industrial conditions



DISSERTATION THESIS

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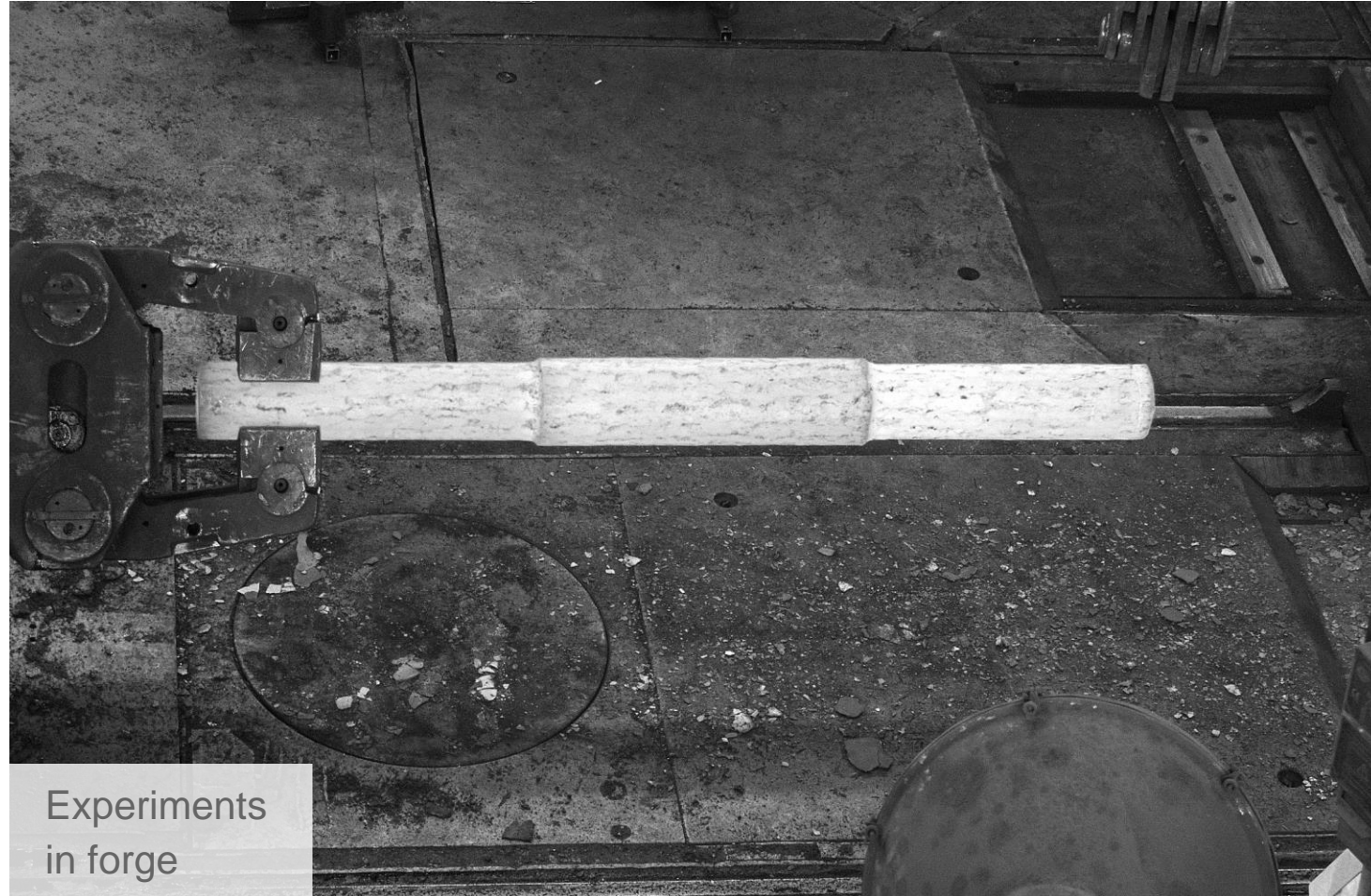


Reference geometry
measurement

DISSERTATION THESIS

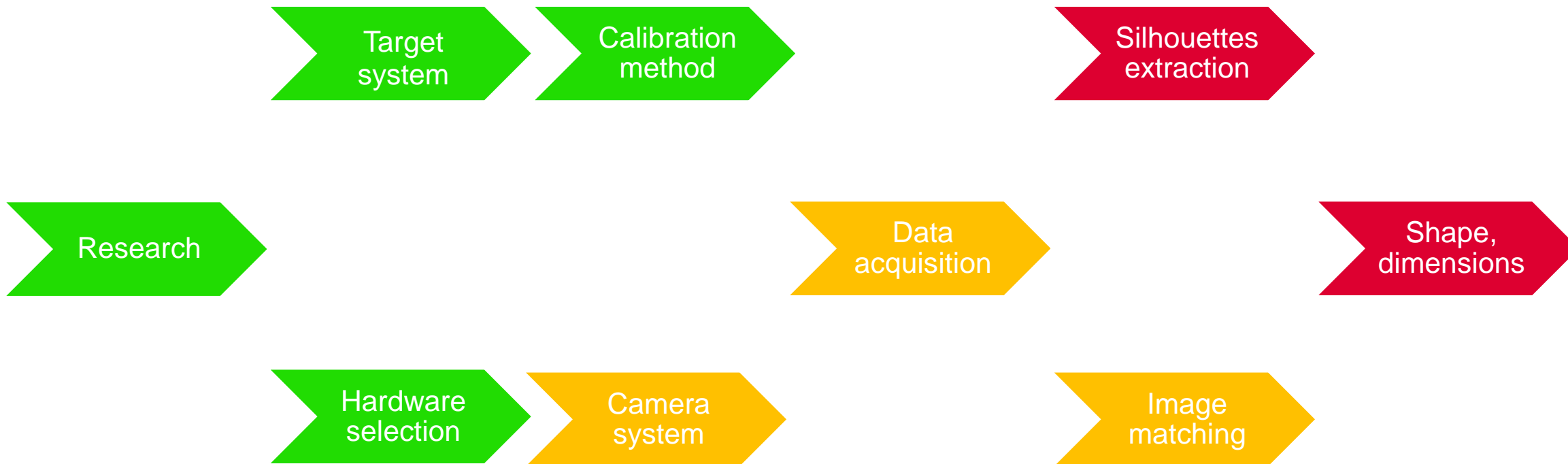
EXPERIMENTS

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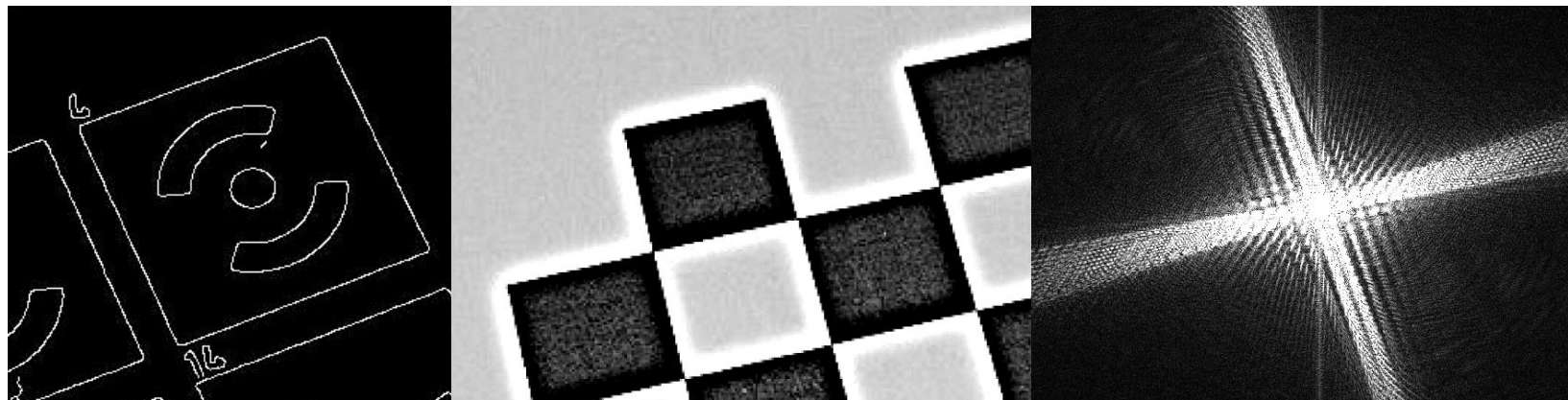
PROGRESS



ACADEMIC ACTIVITIES

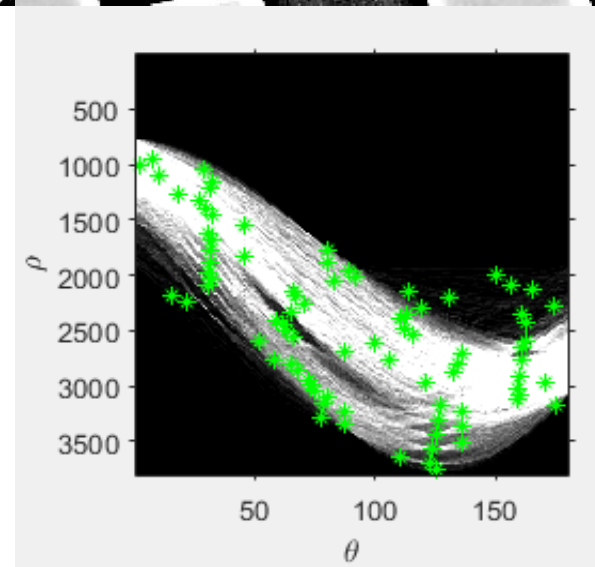
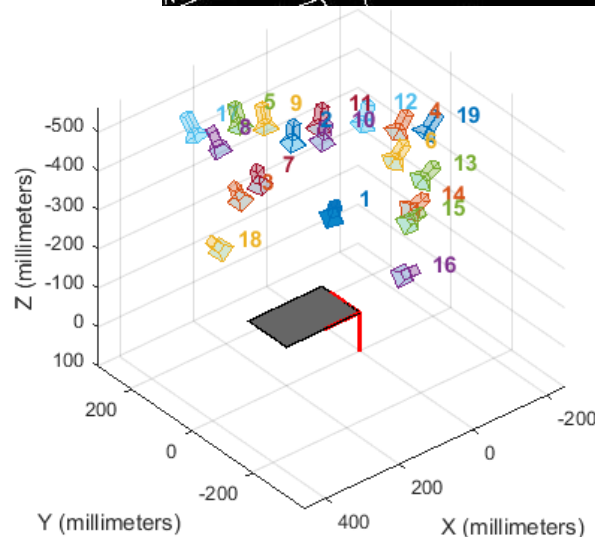
INNOVATION OF ZRI-A

- Edge operators
- Image enhancement
- Fourier transform
- Geometric calibration
- Hough transform
- Segmentation
- Color calibration



SUPERVISION

- Bachelor's thesis
- 3D Scene reconstruction using passive camera stereopair



PROJECTS



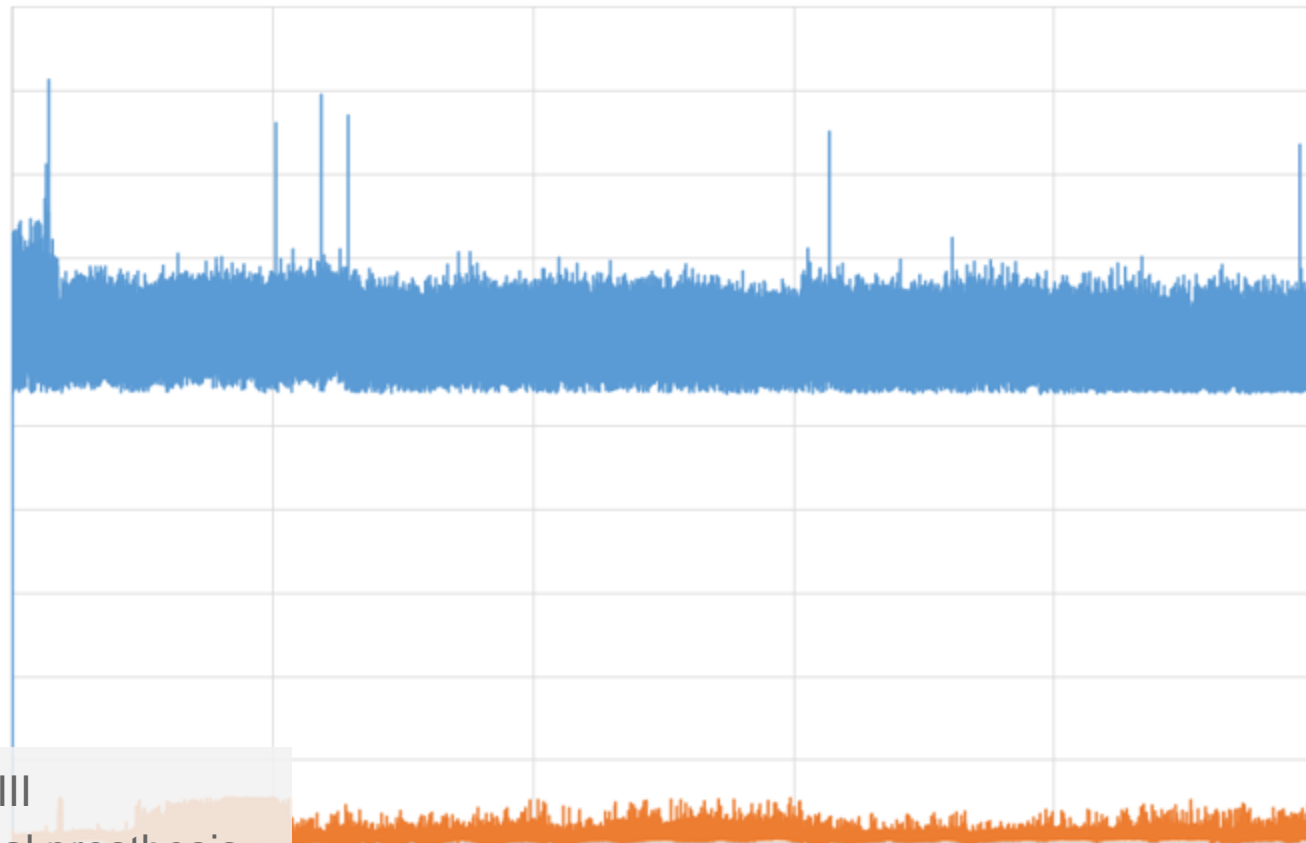
TACR Zéta (Development of optical system for automated measurement of forgings)

PROJECTS



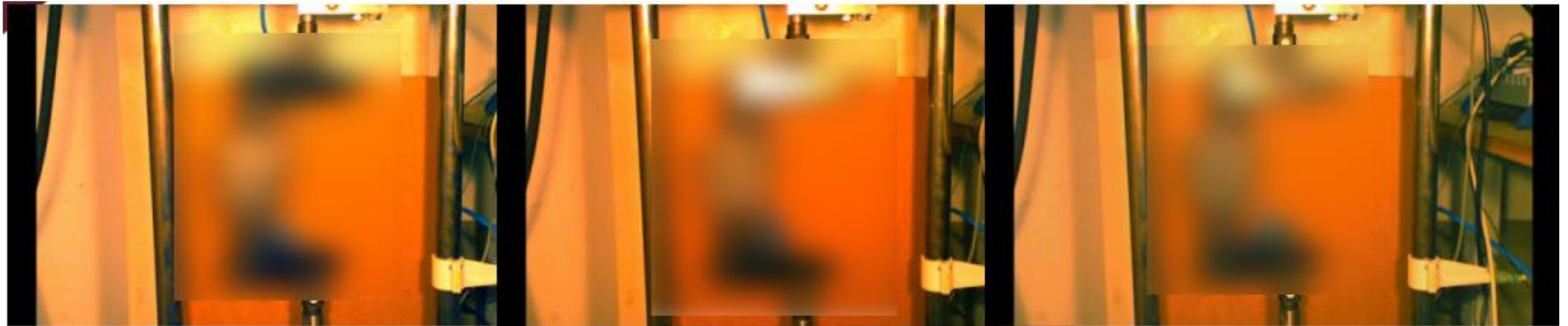
MPO OPPIK Application III
(Development of transtibial prosthesis
manufactured via 3D printing)

PROJECTS



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PROJECTS



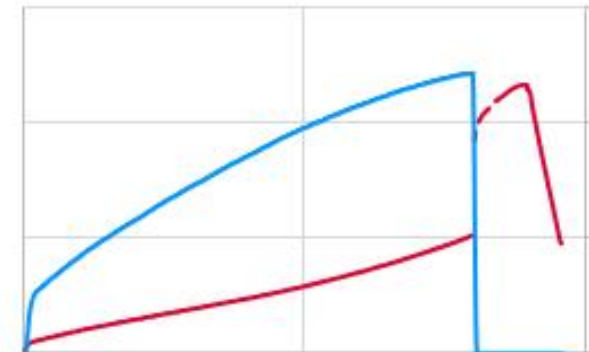
— Deformation
— Load



— Deformation
— Load



— Deformation
— Load



PROJECTS



Innovation voucher × 2
Cannabis trimming
(marijuana.heraldtribune.com)

PROJECTS



Innovation voucher
Sunflower Baby Trimmer
Design M. Krčma, D. Škaroupka
Engineering J. Hurník

PROJECTS



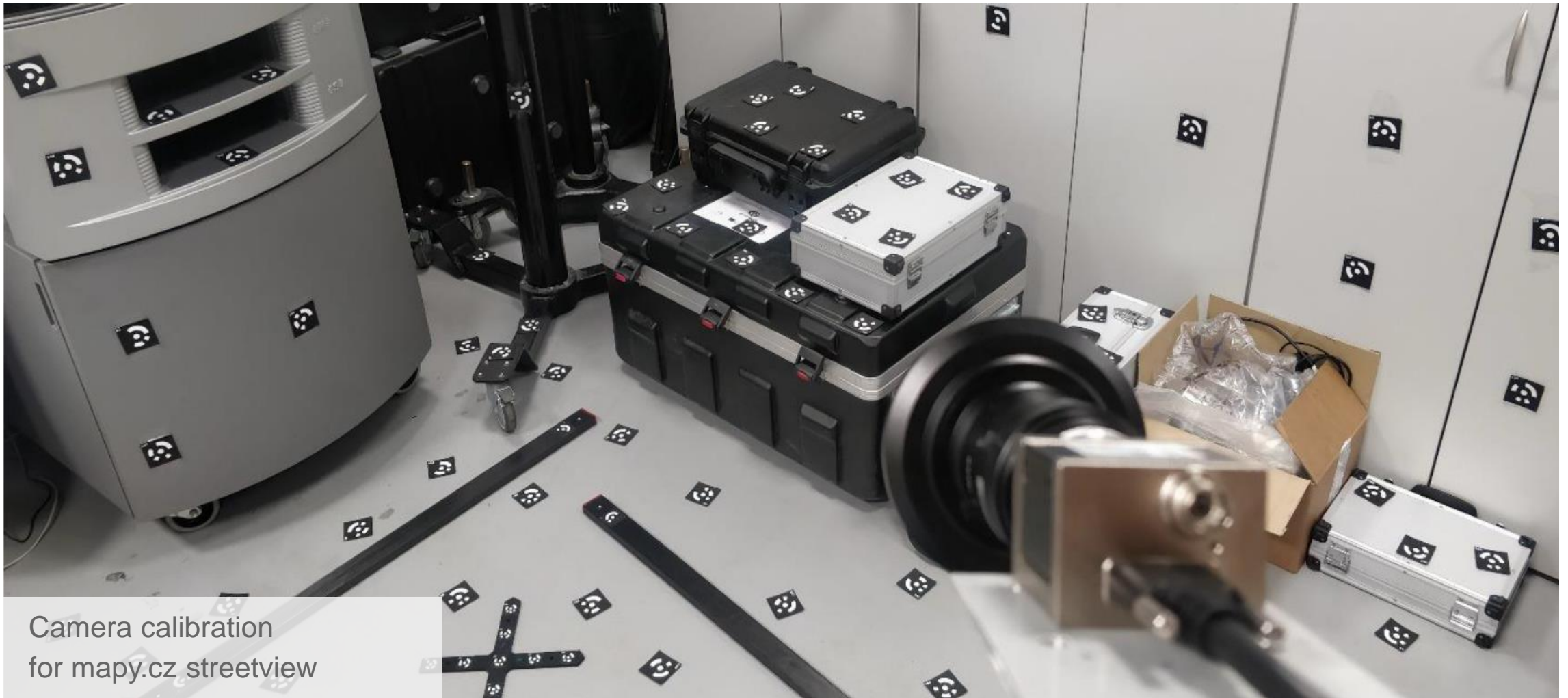
Innovation voucher
Sunflower Automatic Trimmer
Design A. Vespalec, D. Škaroupka
Engineering J. Hurník

PROJECTS



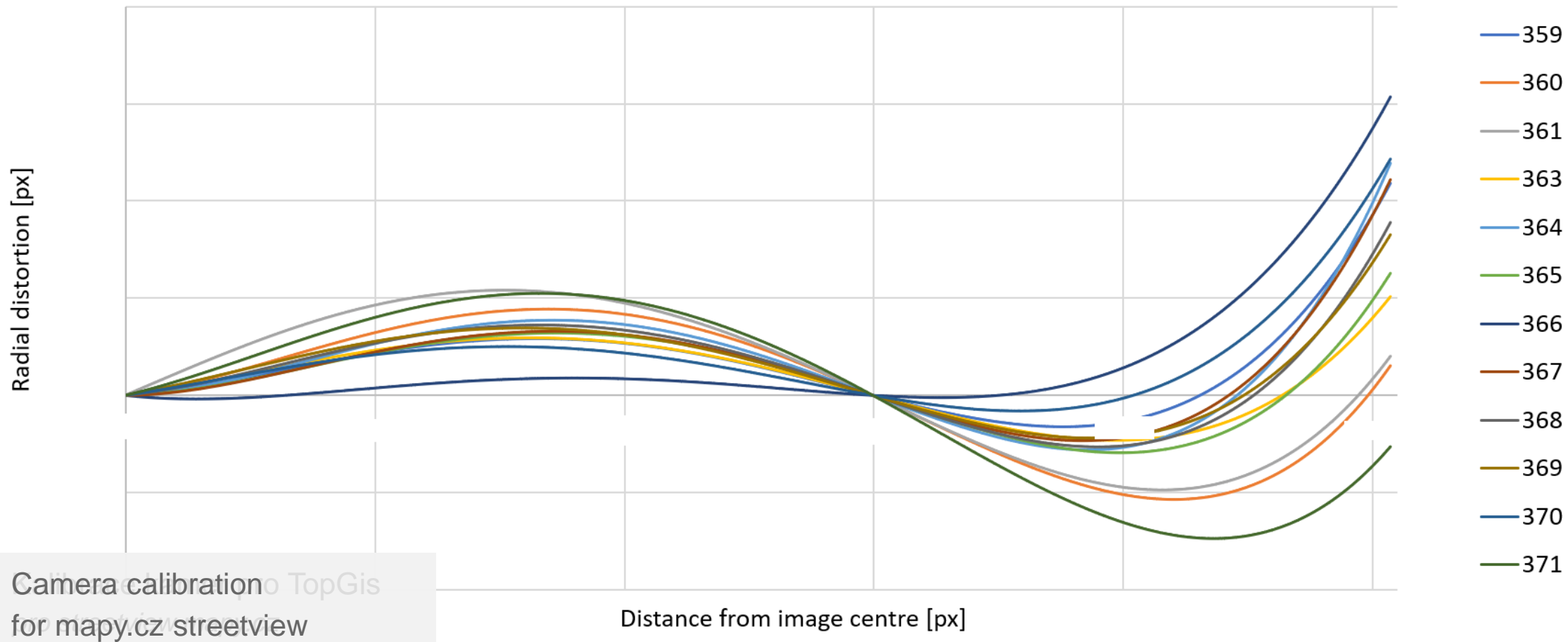
Camera calibration
for mapy.cz streetview
(Coroflot.com, design D. Škaroupka)

PROJECTS



Camera calibration
for mapy.cz streetview

PROJECTS



THANK YOU FOR YOUR ATTENTION

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www.ustavkonstruovani.cz