IMAGE PROCESSING

Technical Problem Solving (TPS)

Prof. Dr.-Ing Christof Jonietz

HOCHSCHULE SRH HEIDELBERG
Intelligence in Learning

1

TECHNICAL PROBLEM SOLVING

Examination form

- General Examination Regulations, ver. 29/07/2019, Appendix 3, p. 10:

Examination form (abbr.):	**Technical Problem-Solving (TPS)**
Examination objectives (skills):	To test students' ability to solve technical problems independently, with the methods of the field, in realistic working conditions (material, methodology, personal and social skills)
Definition and procedure:	Technical problem-solving involves solving a technical task representing a realistic problem, such as could arise as part of a larger project in working life. It generally consists of an analysis of the problem, of the development of several solution options if required, and, in the main, of the development of an individual solution using field-specific methods, relevant literature and rules. Technical problem-solving can include the written form, calculations, sketches and/or programming. It may also involve a final presentation of the results as well as teamwork.

2

TECHNICAL PROBLEM SOLVING

Content

- Project work
- Report paper, up to 5 pages, “conference style”
- Presentation with demo of work
  - > At the end of this course
  - > 10 minutes presentation + 3 minutes demonstration + questions

TECHNICAL PROBLEM SOLVING

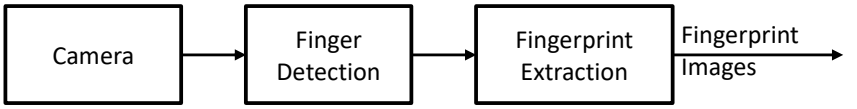
Project work

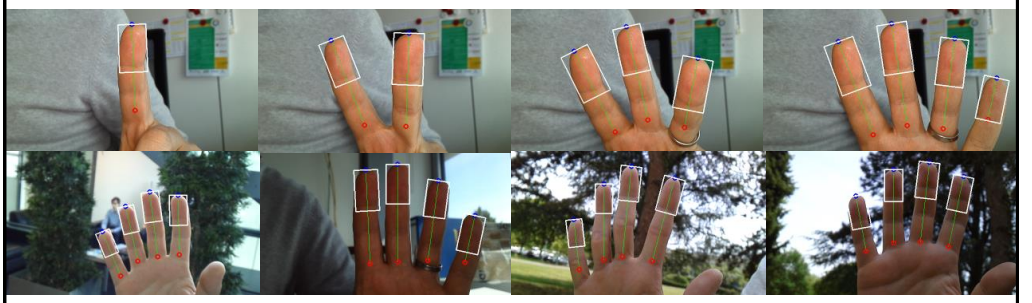
- Improved identification / autentification technology with contactless fingerprint capture
  - enhance the security
  - hygienic aspects
  - make the control less complicated for passengers / travellers
- **HERE:** Capturing process of single / multiple fingerprints from the image
- **NOT HERE:** verification/identification process

TECHNICAL PROBLEM SOLVING

Project work

- Touchless capturing process for fingerprints process pipeline



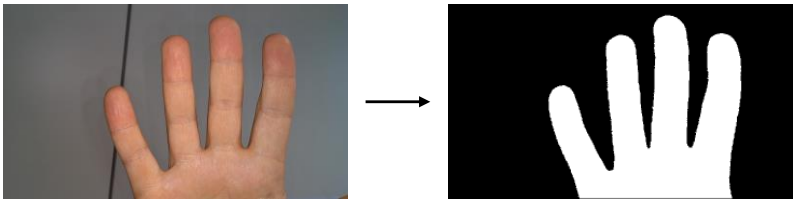


TECHNICAL PROBLEM SOLVING

Project work

1. Step of algorithm: Skin color based hand segmentation

- One straight forward approach for segmentation of body parts is using skin color as a main feature.
  - A. Cheddad, J. Condell, K. Curran, and P. McKevitt. “A new colour space for skin tone detection.” *IEEE International Conference on Image Processing (ICIP)*, 2009 16th, pages 497–500, Nov 2009. (paper available on my SRH cloud)
  - Or other … e.g. HSV …

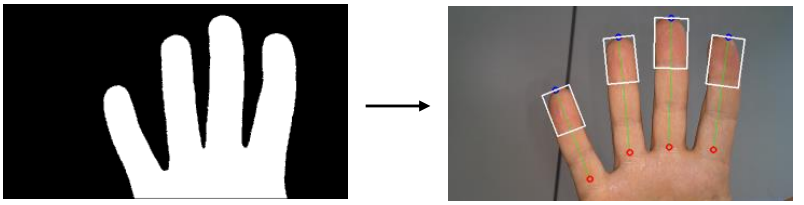


TECHNICAL PROBLEM SOLVING

Project work

2. Step of algorithm: Fingerprint extraction from segmented palm/finger

- Evaluation of e.g. the contour / perimeter of segments hand / finger(s)
- For one finger quite easy, more complicated for multiple fingers
- A lot of methods discussed on the www.



TECHNICAL PROBLEM SOLVING

Project work

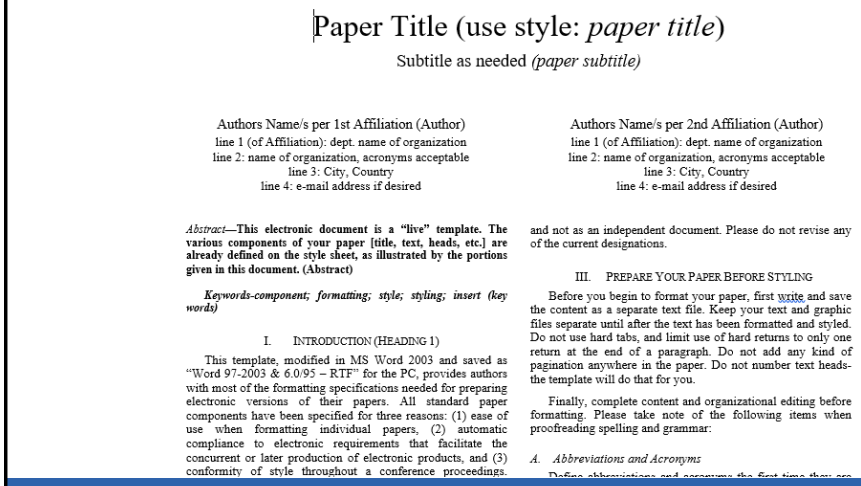
- Content:
  - Fingerprint ROI detection algorithms
    - > Skin color hand/finger segmentation (→ demonstrate it!)
    - > Fingerprint detection algorithm (→ demonstrate it!)
  - Results
  - Conclusions

- The performance and grade of complexity of your algorithm influences grading:
  - Segmentation result
  - Number of fingers / hand palm segmented?
  - Fingerprint region(s)? (NOT only finger tip!)

TECHNICAL PROBLEM SOLVING

Report paper

- ~ 5 pages in paper style format (template → cloud)



Paper Title (use style: *paper title*)

Subtitle as needed *(paper subtitle)*

Authors Name/s per 1st Affiliation (Author)
line 1 (of Affiliation): dept. name of organization
line 2: name of organization, acronyms acceptable
line 3: City, Country
line 4: e-mail address if desired

Authors Name/s per 2nd Affiliation (Author)
line 1 (of Affiliation): dept. name of organization
line 2: name of organization, acronyms acceptable
line 3: City, Country
line 4: e-mail address if desired

Abstract—**This electronic document is a "live" template. The various components of your paper [title, text, heads, etc.] are already defined on the style sheet, as illustrated by the portions given in this document. (Abstract)**

Keywords-component; formatting; style; styling; insert (key words)

I. INTRODUCTION (HEADING 1)

This template, modified in MS Word 2003 and saved as "Word 97-2003 & 6.0/95 – RTF" for the PC, provides authors with most of the formatting specifications needed for preparing electronic versions of their papers. All standard paper components have been specified for three reasons: (1) ease of use when formatting individual papers, (2) automatic compliance to electronic requirements that facilitate the concurrent or later production of electronic products, and (3) conformity of style throughout a conference proceedings.

and not as an independent document. Please do not revise any of the current designations.

III. PREPARE YOUR PAPER BEFORE STYLING

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

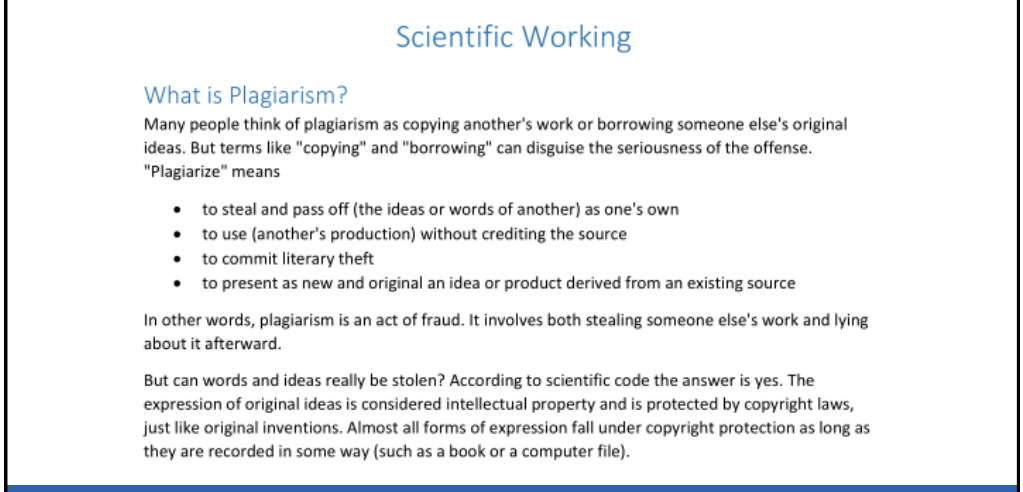
Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

A. Abbreviations and Acronyms

TECHNICAL PROBLEM SOLVING

Report paper

- Information sheet on scientific working (→ cloud)



Scientific Working

What is Plagiarism?

Many people think of plagiarism as copying another's work or borrowing someone else's original ideas. But terms like "copying" and "borrowing" can disguise the seriousness of the offense. "Plagiarize" means

- to steal and pass off (the ideas or words of another) as one's own
- to use (another's production) without crediting the source
- to commit literary theft
- to present as new and original an idea or product derived from an existing source

In other words, plagiarism is an act of fraud. It involves both stealing someone else's work and lying about it afterward.

But can words and ideas really be stolen? According to scientific code the answer is yes. The expression of original ideas is considered intellectual property and is protected by copyright laws, just like original inventions. Almost all forms of expression fall under copyright protection as long as they are recorded in some way (such as a book or a computer file).

TECHNICAL PROBLEM SOLVING

Final Grading

- For grading, submitting the **software project**, the **report paper**, and the **final presentation** is a presumption.
- Submitting the TPS
  - Prepare zip-file with
    - > **Source (C/C++ files)**
    - > **Report paper (PDF)**
    - > **Presentation (PDF)**
  - Naming convention of the zip file:
    "IP_TPS_Matriculationnbr_LastFirstName.zip"
- Grading:
  - 50% report paper
  - 50% presentation + demonstration

TECHNICAL PROBLEM SOLVING

Evaluation Criteria for presentation + demo

Criterion	**Presentation**	Presentation (flow of speech expressiveness, correctness technical language)	Organization (Logical presentation of ideas, objectives/goals are clearly stated, results are clearly presented)	Knowledge of Material (Familiarity with subject matter, correct answer questions with confidence)	**Demonstration / Achievement of objectives**	Quality of hand palm / finger segmentation (perimeter, clutter noise, etc.)	Detection of fingerprint ROI (1 finger, multuiple fingers, hand palm)	Software robustness (runtime crashes, etc.)
Max. Points (SUM=100)	**50**	10	20	20	**50**	20	20	10