Research plan (Confidential) Lappeenranta 2018-12-11

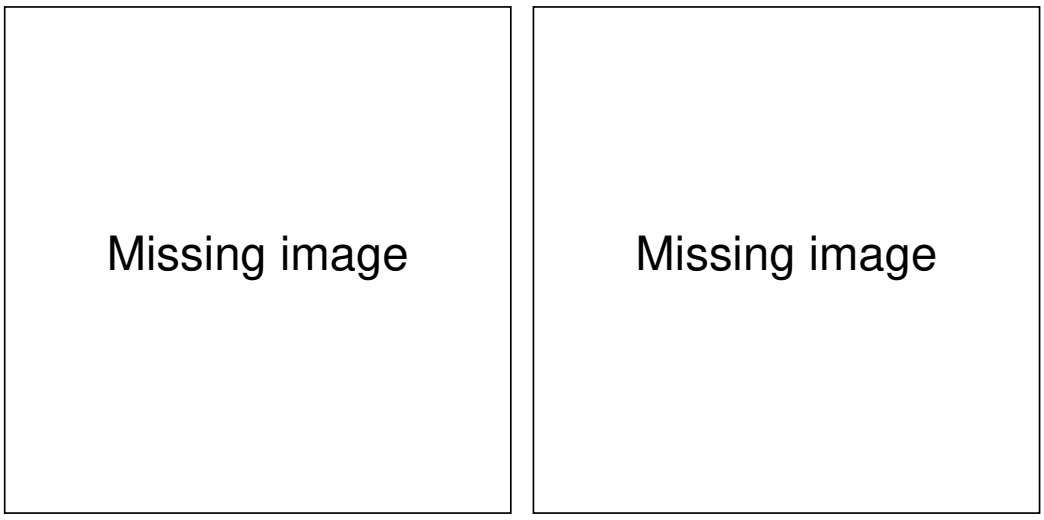
Topic:	**PROJECT TITLE (ACRONYM)**
Related to:	RESEARCH FOCUS AREA (ACRONYM)
Resources:	N. N., DAY.MONTH.YEAR–DAY.MONTH.YEAR
Results:	(1) Background information,
	(2) METHOD DEVELOPMENT,
	(3) EVALUATION, and
	(4) Documentation.

Date	Author	Comments	Status
YEAR-MONTH-DAY	LTL	Initial version	Draft

1 Background

Evidence-based medicine (EBM) is the current practise in many subfields of medical science. In this approach, the medical diagnosis and planning of treatment is based on scientific knowledge and objective examination of the patient through biomedical measurements. One example of the knowledge used in the process is images because of the versatile possibilities to image the condition of the patient or her organs. From this viewpoint, the medical doctors base their decisions nowadays on a more complete and timely view to the situation.

Eye diseases have become one of the rapidly increasing health threats worldwide. For example, diabetes causes abnormalities in the retina (diabetic retinopathy), kidneys (diabetic nefropathy), and nervous system (diabetic neuropathy). The diabetic retinopathy and other eye-related diseases are diagnosed from eye fundus images (Fig. 1) by medical experts who look for special lesions in the images. The attention of medical expert in fundus examination restricts the possibility to perform broad screenings. For screening and monitoring a progressive disease, automatic image processing methods are a well-motivated possibility to help a single expert's work, or enable a wider screening program.



(a) Missing image. (b) Missing image.

Figure 1: Example images.

2 Objectives

The objectives of this research are as follows:

1. Carry out a literature search and write a review about the findings.

2. Study the available methods for ...
3. Implement a selected method for ...
4. Evaluate the method performance with the existing data, and analyse the results.
5. Document the work in the form of a ...

3 Research methods and material

3.1 Research methods

In this reasearch, the focus is on ... The required research methods and evalution procedures arise from the preceding research of Machine Vision and Pattern Recognition (MVPR) and, when appropriate, the standard ones within the research field(s). In addition, capability to do independent work (under supervision) and good skills in the English language are needed.

3.2 Research steps

The main steps of the work are given below.

Background

1. If not familiar, study the version control system used in the project. Start using the repository/directory specified by the supervisor(s) and commit your changes daily. For the data used in the research, results produced in the experiments, and literature produced by others, use the file server (not the version control repository) as instructed.
2. If not familiar, study documentation with LaTex and BibTex. Take the existing template and update the manuscript as the research progresses.
3. Study the preceding relevant work and the available data accessible to MVPR.
4. Review the relevant in-context literature and acquire at least an initial understanding of ...
5. Write a review of the found methods to the manuscript.

   (**Result 1**: Background information)

   METHOD DEVELOPMENT
6. Review the literature on ...
7. Study ...
8. Initially experiment with ...
9. After selecting the approaches to use with the supervisor(s), implement the methods.
10. Plan and carry out validation experiments on the available data.
11. Document the methods and results in the thesis manuscript.

    (**Result 2**: Alignment of image and model spectra)

    EVALUATION
12. Study ...
13. Design the experiments based on ...
14. Carry out the performance evaluation experiments with the available data, and analyse the results.

15. Document the methods and results in the thesis manuscript.

    (**Result 3**: Inversion of spectral images)

    Documentation

16. Complement the thesis manuscript as needed.

17. Get comments from the supervisor(s).

18. Finalise the manuscript according to the comments.

    (**Result 4**: Documentation)

4 Implementation

4.1 Timetable

The tentative schedule for the work is shown in Table 1. The relevant notes are as follows:

- The order of the topics in the schedule should not be understood as fixed. Some topics can be studied in parallel.
- If instructed by the project manager, all the working hours must be put into the work time management system.
- There will be a full evaluation of the results after the research work. Possibilities for further publication of the results will be considered.

Table 1: Timetable for the research.

Result / Month	**1**	**2**	**3**	**4**	**5**	**6**	**Weeks**
Background information	2	0	0	0	0	0	2
METHOD DEVELOPMENT	2	4	2	2	0	0	10
EXPERIMENTATION	0	0	2	2	4	0	8
Documentation	0	0	0	0	0	4	4
Weeks	4	4	4	4	4	4	24
Plan	4	4	4	4	4	4	24
Balance	0	0	0	0	0	0	0

5 Researchers and research environment

The following researchers will take part to the research:

Position	Name	Notes
Research assistant	N. N.	

6 Mobility

This research requires collaboration with experts working on different fields of science. Research visits in this regard are performed as needed.

7 Researcher training

N. N. will get experience on research work within the field of image processing. The project strengthens the medical image processing research in MVPR and supports the specialisation of the supervisor(s) in the topic.

8 Expected results and risks

The expected results are as follows:

- Literature reviews on selected methods for ...
- A method for ...
- Experimental results in the form of ...
- The documentation and notes for future work.

The potential risks include the following:

- Due to the challenging topic, the timetable planned for the research is unrealistic. It means that all the objectives may not be fully achieved.
- The literature review brings up research which affects the novelty of this research. This would affect the plans to publish the scientific results.

References

A Notes about literature surveys

A few notes for starting a literature survey:

1. Select initially a focused set of keywords for literature searches. If you end up with too few items in the searches, edit the keywords to become more general. Update the set of keywords as needed.
2. To make literature searches, make use of the following:
   - Google Scholar.
   - The publisher databases accessible through LUT library such as IEEE Xplore, Scopus and Springer.
3. Focus on articles that have a high number of citations and/or have been published in top journals or top conferences.
4. Read the abstracts and conclusions to be able to say whether each article is relevant for your research.
5. When you find an interesting paper:
   - If the paper is an author's manuscript, for example, in arxiv, ResearchGate or something similar, check whether the article has been properly published and use that version.
   - Go through the list of references of that paper to find the earlier works on the topic.
   - Use Google Scholar or another database to get a list of papers that cite the paper and review them.
   - For significant research groups related to your research, go through the publication lists of the authors.
   - Store the bibliography information and electronic article copies to a bibliography management system such as Zotero.