



WT2.17: Information Technologies Institute, Thessaloniki, Greece

Report

Activities performed during the visit

in ITI Thessaloniki

period: 28-08-2015 -11-09-2015

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The main building of ITI

Personal Information

Mr. Jerzy Sas , faculty member of member of Wrocław University of Technology, faculty of Computer Science and management, Poland visited Information Technologies Institute, Thessaloniki, Greece in the period from 28-08-2105 to 11-09-2015 in order to carry out research and training activities in the field of image analysis and understanding, in particular: a) to carry out consultations on current results of the common work related to patent image segmentation and b) to develop and initially test selected methods of caption-driven image segmentation.

Information about Seminars

The seminar to a small group of researchers was organized on 11.09.214. It was entitled: “Partial results and encountered problems related to patent image segmentation”. The aim of the seminar was to present the current state of works and to discuss achieved preliminary experimental results.

Description of scientific activities

The main aim of the visit was to make progress in works related to patent image segmentation, according to agreements done during the previous visit in ITI in September 2014. During the period since the previous visit the method of caption detection was elaborated and tested on the set of images provided by ITI, tools for manual image segmentation were designed, implemented and documented and a set of patent images provided by ITI was manually segmented. Also three proposals of segmentation algorithms

were prepared in WrUT. It was the base for the works that were planned to be carried out during the visit. The particular goals of the visit were:

1. to present obtained results in caption detection, to analyze typical errors and to find out the method extensions that reduce the error rate caused by typical reasons,
2. to present the tools to the ITI partners and to make modifications and extensions according to ITI researchers suggestions,
3. to discuss proposals of segmentation methods elaborated in WrUT and the proposals of researchers from ITI and to select the most promising methods for implementation and further tests,
4. to implement the selected methods and to carry out preliminary test on the limited amount of images,
5. to present obtained results to the small group of interested ITI researchers and to determine directions of further works.

The following ITI researchers participated in consultations:

- Anastasia Moutzidou - the main researcher and developer involved in the project,
- Stefanos Vrochidis - supervisor,
- Ilias Gialampoukidis - an expert in clustering methods and of community detection.

The first introductory meeting was held on the first day of the visit (28.09.2015). The participants of the meeting were: A. Moutzidou, S. Vrochidis and J. Sas. The aim of the meeting was to show results of works carried out at WrUT, to propose some methods of image segmentation and to select most promising methods for immediate implementation. It was decided that in spite of some caption detection errors we will now focus on the development of the segmentation methods that assume correct caption detection. The method proposals of both sides were presented. All discussed methods were based on the assumption that specific subimage captions were successfully detected. Therefore the methods can be called “caption-driven”. Proposals from WrUT were:

- intuitive method based on two-phase clustering of connected components (CCs), where in the first phase big CCs are assigned to captions based on minimal distance to it and then in the second phase smaller CCs are clustered by finding the cluster with closest pixel distance to any component of already clustered CCs,
- the method based on k-means clustering of CCs with various distance measures,
- the method based on the optimization of CCs grouping criterion.

ITI researchers proposed to implement the clustering methods that are adaptation of community detection to image segmentation. In this approach the caption detection is used merely to determine the number of clusters (subimages). The

advantage of the method is that it can be also used without prior knowledge about the number of clusters. Hence, it can be applied also in the case where caption detection fails (no captions found, e.g. because of the very untypical font).

We agreed that we will begin with the implementation of intuitive method and the method adapted from community detection.

In order to better understand the idea of application methods from the field of community detection to image segmentation we had additional meeting with ITI expert in this area - Ilias Gialampoukidis. This meeting was held on 2.09.2015.

During the following days we (J. Sas and A. Moumtzidou) focused on implementation of our methods. We had a series of working meetings during which we were consulting current problems encountered in our works on implementation. Finally, the two-phase intuitive method was successfully implemented. It was also preliminarily evaluated using small set of selected images. The results are promising, but the method needs extensions aimed on typical problems of segmentation. It was observed that the common error in the first method phase lies in erroneous assignment of CCs located on the opposite sides of the caption.

Unfortunately the adaptation of community detection methods to image segmentation turned out to be not so easy, so we did not manage to complete its implementation during the visit period.

We prepared the document describing the caption-driven approach to image segmentation that also includes the proposal of quantitative segmentation accuracy assessment based on popular F1-measure. In future, after completion of method's test, the document will be extended to an article.

During the closing meeting on 11.09.2015 a short seminar was organized which presented results achieved so far. We outlined directions of further works as follows:

- completion of implementation of the method based on community detection,
- carrying out tests on bigger amount of images and evaluating methods accuracies
- implementation of remaining proposed segmentation methods and its comparison on big dataset.
- writing the common paper presenting final work results.

Information referring to the intellectual property

This topic was subject to the previous visit in 2014 and this time it was not being considered.



Description of the cooperation between universities and industry

This topic was subject to the previous visit in 2014 and this time it was not being considered.

Other activities

During the visit I also participated on 31.08.2015 and 2.09.2015 in selected lectures of ESSIR 2015 - Summer School on Information Retrieval hosted by ITI/CERTH

REMARK: Apart from this information also a program of the visit and the presentation in electronic version should be given to the project office (please send all of them to Urszula.Markowska-Kaczmar@pwr.wroc.pl). Please respond to the points 1-5 for outgoing visit and points 1-3 for incoming visit. Point 6 is for extra activities that are not put in points 1-5.

