Topological invariants and their usage

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Image processing, character or any other object recognition has been actively researched since the last century. Important part of image processing is character recognition, it means analysing and processing text documents represented by images. Software addressing stated problem is called OCR, OCR can be used in different ways:

- Data entry, scanning and transforming business documents
- Automatic number plate recognition
- Extracting business card information into a contact list
- Make electronic images of printed documents searchable

Goal for this thesis is to research alternative ways of optical character recognition. Defining topological invariants of georgian symbols and using them. Researching the algorithms which contribute effective calculation of defined invariants. Thresholding, skeleton detection, object thinning. Also implementing those algorithms into application for practical use and testing.

Seminar presents the results of research conducted in 2016 about alternative ways of optical character recognition. The main directions are described in [1]. In developing and testing topological invariants, we are using OpenCV Computer Vision with Java (see[2], [3]). OpenCV has rich set of implemented algorithms, but some of them were refined by us on the basics of special references ([4], for example). Topological invariants originally were described in [5].

Abstract

The core idea of our research was topological invariants. For each symbol we define unique topological characteristics to classify groups of symbols. From practical standpoint extracting invariants requires heavy preprocessing of source image, which is multi step process. One of the key steps during preprocessing is graph based thinning. Results obtained from this step is then used for extracting features mentioned above. Also for testing and experimentation we needed flexible framework for changing and adapting, so different design patterns were used and modified for our needs.

References

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