

Problem Statement for “Image Recognition” project

Problem:

Image processing becomes a crucially important component in the modern digital world. Natural human ability to recognize objects on an image allows to quickly receive information and draw conclusion about the object (“A picture is worth a thousand words”). This becomes an attractive and superior alternative to text processing. By its nature, images can better reflect the real world by presenting objects that comprise it.

Many research groups one way or another deal with images obtained from experiments. It is because images are able to quickly take a snapshots, or capture current state of matter in time. Human processing of large number of images (such as remote galaxies or microscopic biological systems) becomes very time consuming and inefficient.

Current web search engines can efficiently process text data even in cases when request is made for image or video files based on the text that is associated with it. It ultimately brings inconsistency problem when text associated with an image not necessarily describes the content of the image. Moreover images often contain richer information that can hardly be described by text

Large social networks like Facebook or MySpace work with pictures that users upload. In some cases it is important to quickly and effectively extract information from the pictures and present it in the way users like them to be presented (such as thumbnails or faces on an image). Pictures processing could bring the social communities to a new level of communication allowing extraction and organization of objects presented on the picture without any hassle.

Objectives:

The objectives of the project are:

- Build the desktop application with intuitive GUI that will
 1. Allow user to set the pattern of an object to be recognized
 2. Recognize simple objects (like circle, square or equilateral triangle) from the set of image files.
 3. Draw statistics of the recognized objects (such distribution of an object with size)
 4. Save the report in convenient form.
- Build a web search engine that will except the request from the user in textual form and return images that correspond to the the request.

Example Scenarios:

Mary just made cool microscope images of colloidal particles and would like to know the distribution of the particles with size to find out whether size of particles has changed when she added more acid or whether the particles retained their shapes at all. So she opens the image file that she likes to recognize, chooses the pattern for the particles and clicks the option "Image recognition". The program processes the image and shows the distribution of the colloidal particles. Mary can choose then the format to save the statistics of the recognized image. She can also choose the set of image files she wants to get statistics for.

Sergey is eager to find all images that contain his favorite constellation of Cassiopeia and he definitely knows much about it. So he enters the search parameters in the search bar to find images that might include the constellation and the search engine shows the images that correspond to that request.

Functional Requirements:

In the desktop GUI application the user will be able to:

- Open the PNG file (only PNG image format will be supported in this project)
- Choose the pattern out of already existing patterns (circle, square, triangle)
- Run image recognition process based on the chosen pattern
- Choose the format that the results should to be presented. There will be two options: diagram representation and text format
- Store the results of image processing on the hard drive
- * Process several image files at a time.

In web based application user can:

- Enter textual request in the search bar (circle, square or triangle) with number of objects that user wants to find
- Enlarge the found images to the original size
- * Choose the pattern and send it to the search engine as a request.

Non-Functional Requirement:

- The files to be processed should already exist in the folder
- Use existing algorithms that can quickly process images

Target Environment:

At initial stages

- The target category of users for desktop application might be research groups that produce images of objects with simple shapes.
- The web based application is intended for any category of users.

* (*asterix*) marks the functional requirements that might be supported in the future and not included in the current project.