IDP: Rapid prototyping image processing filters for systems integrators

Initial Situation
Computer Vision covers a growing amount of applications in private and industry sector. While applying similar vision hardware, a high flexibility of those computer vision systems is derived by the broad fields of image data processing. Therefore we apply a computer vision system on a forklift to replace a couple of different sensor systems and reduce re-fitting efforts on forklifts.

Using image processing to develop such sensor systems requires detailed knowledge on image processing on the systems integrators side. However, many systems integrators for forklifts are small and medium-sized businesses and lack both detailed knowledge and experience in image processing.

Tasks
To make development process easier for this group and also allow for rapid prototyping of image processing chains in general, a graphical user interface to try image processing filter combinations and their (intermediate) results is necessary. In order for such a tool to be useful to systems integrators, it needs to group, present and explain useful image processing filters in such a way, that an employee of such a company can choose and try out an image filter (and play with its parameters) based on knowledge about conditions defined by the process in which the vision system has to operate.

For example one such category could be:

- Bad and frequent change in lighting
  - Dynamically adapt exposure time (not really an image filter)
  - EqualizeHistogram filter (equalizes histogram)
  - …

Another might be

- Show picture to human
  - Reduce/increase contrast
  - Draw frame to mark areas
  - …
After researching typical environment and process conditions in common logistics areas (i.e. warehouses) you will define categories based on your research and develop a (rudimentary) methodology to map the set of image filters supported by the opencv2 library to those categories, so that for each of the categories useful image filter candidates (and vice versa) can be presented to a user with detailed knowledge on the categories but few knowledge on image processing.

Finally you will create or enhance an open source tool, to demonstrate your methodology, covering the following features:

- Show list of image filters suitable for a category (according to your methodology)
- Show list of categories a filter is suitable for (according to your methodology)
- Short explanation what the filter does and more importantly how the filter benefits the situation based on the context (=category)
- Allow user to specify a media source (image, video, live camera)
- Apply a sequence of filters chosen by the user and show the (intermediate) results.

This project will use open source libraries on computer vision, e.g. OpenCV, wherever suitable. A high overlap with private interests in different computer vision applications is possible.

**Qualifications**

- Independent, method-driven and creative working habits
- Programming skills
- Basic interests in methods of image processing