Preliminaries
This is two-person project. Pick a project team member, and register your group ONLINE by Tuesday week 5.

Project Synopsis
The project consists of two parts, with checkpoints built in to enable you to manage the project and the deliverables. Read the project specification through carefully, and discuss with potential team member before registering your group!

Part 1
This part is common to all groups.
Feature detection and matching form the foundation of many successful applications of computer vision. The objective of this task is for you to become familiar with these techniques and their implementation in OpenCV.

A panograph is a special form of image stitching, in which a number of (overlapping) images are automatically translated and optionally rotated and scaled, before being blended with simple averaging (Szeliski, section 6.1.2 and Exercise 6.2). See the flickr link below for some artistic examples: http://www.flickr.com/photos/tags/panograph/

In addition to the final panograph you should be able to display any pair of images side by side with lines showing potential matches. You can base your solution on the following OpenCV sample programs:

opencv\samples\c\find_obj.cpp
opencv\samples\cpp\video_homography.cpp
opencv\samples\cpp\generic_descriptor_match.cpp

There will be two bonus marks for implementing additional features such as automatically detecting the images that are to be included in the collage, exposure correction or alpha blending.

Testing of Part 1
Collect several sets of images to verify the performance your algorithm e.g. photos of the UNSW campus. A collection of eight test images of an outdoor scene will be released on the day of the demo. You should also provide a two page report giving a high level overview of your approach.
Part 2
In the second part, your team should select ONE direction of further work, do the necessary literature survey on techniques and algorithms, implement them and write a detailed report. You should also find suitable datasets to work with. The week 10 presentation (see checkpoints below) will provide an opportunity to get feedback from lecturers on your chosen direction.

Detailed instructions on Part 2 presentations, reports and final demo will be provided before the respective deadlines.

Here are some possible lines of further work. Your team is encouraged to do its own research and decide on a line of further development. The direction you choose may also be different from the suggestions made in this section - use the week 10 presentation or ask us in the lab earlier to get feedback.

Possible directions
Some sample projects are described below. These are not prescriptive, and you are encouraged to define your own project, if necessary in consultation with your lab demonstrators.

Datasets:
“Computer vision papers online” has a comprehensive list of public datasets used in recent computer vision research. You can use these in your projects.
http://www.cvpapers.com/datasets.html

Easier projects:
• Efficient video search
  Build a system that efficiently finds all (or at least some) occurrences of a particular backdrop, prop, or another object in a video. Only retrieval needs to be fast, you can do any amount of preprocessing beforehand.
  J. Sivic, A. Zisserman Video Google: A Text Retrieval Approach to Object Matching in Videos
  http://www.robots.ox.ac.uk/~vgg/publications/papers/sivic03.pdf

• High Quality Panoramas
  Develop an automatic panorama generation system allowing for a richer class of transformations than a simple panograph. There is a discussion in chapter 9 of Szeliski.

Harder projects:
• 3-D Reconstruction from video / augmented reality
  Reconstruct 3D geometry (e.g. a point cloud) from a video captured by a handheld camera. Optionally, can you use this information to insert a rendered object into the video?
  Iryna Gordon and David G. Lowe, "Scene modelling, recognition and tracking with invariant image features"
  Stephen Se, David G. Lowe and Jim Little, "Global localization using distinctive visual features

• Photo Tourism
  Construct a 3D model of an architectural landmark from a collection of photographs collected from the Internet. You can use the following paper as the starting point and search for others that
Other project ideas may be discussed in the lab.

**Reports**
Both preliminary and final reports for the second part of the project should be in two column IEEE format ([http://www.ieee.org/web/publications/authors/transjnl/index.html](http://www.ieee.org/web/publications/authors/transjnl/index.html)), maximum of 4 and 8 pages respectively. Marks will be deducted for poor formatting.

**Code Submission**
Even though not directly assessable, it is a requirement that final code should be submitted at the very end.

**Checkpoints**
- Week 7 Demo on Part 1 (10 marks)
- Week 10 Presentation + Report (10 marks)
- Week 13 Final Demo + Report (10 + 10 marks)
- Weeks 5-12 Lab attendance and participation (10 marks)

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