ECOR1051 Project Description

Fall 2019

Milestone 1

This document is meant to be read in conjunction with the overall Project Description. It describes only those tasks associated with Milestone 1.

The first milestone spans three regular lab periods. Accordingly, to help you manage your workload, the work is described as three labs.

* Attendance at lab periods is mandatory
* Time management is one of the skills that you are learning to develop during this project. Not all tasks have deliverables due immediately after the lab period; however, it is highly recommended that you complete the work of each task by the end of each corresponding lab period.

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# Milestone 1 Submission Summary

***Code submissions will only be worked if the given filename conventions are followed, and your name is part of the docstring for each function that you wrote.***

* By the end of P1 your first lab during the week of November 4th
  + Give a printed and signed copy of the final page of your team contract to your TA
    - If you submit it at a later lab, it will be accepted but will be marked as late.
  + CULearn Submission (Each Individual):
    - ITP Metrics Conflict Management Report
      * Filename: **Conflict-Management-Your\_Name.pdf**
    - Team Contract (Electronic Version)
      * Each individual will submit the **same** team contract. By doing so, the individual indicates that s/he agree to all terms laid out in that contract.
      * Filename: **xxx-teamContract.pdf** where xxx is your CULearn group identifier
    - CULearn Quiz (Each Individual): **Understanding RGB**
* By the end of P2 your second lab during the week of November 4th
  + CULearn Submission (Each Individual): The code for your specific filter and test
    - Filename: **xxx**-**P2-yyy.py** where **xxx** is your CULearn group identifier and **yyy** = {red, green, blue or combine)
    - Note: You will be marked individually, during your demonstration to the TA. The CULearn submission is for backup and archival purposes only.
  + CULearn Submission (Group, by the Leader): The combined code for all filters and tests
    - As a group, demonstrate all completed filters to your TA. Each individual must identify themselves to the TA, and which filter they wrote.
    - Filename: **xxx**-**P2-channel-filters.py** where **xxx** is your CULearn group identifier

**Sunday, November 10, 11:59 – Final Deadline for all submissions of P1 and P2**

* Before P3 your first lab during the week of November 11th
  + Prepare a draft of the Project Report so that your TA can provide feedback to you.
* By the end of P3 your first lab during the week of November 11th
  + CULearn Submission (Group): Project Report
    - Filenames: **xxx-projectReport.pdf** where xxx is your CULearn group identifier
  + CULearn Submission (Individual): ITP Metrics Peer Assessment
    - Two PDF files per person: **Peer Feedback** and **Team Dynamics Assessment (exact filenames will be determined by ITP Metrics)**

**Wednesday, November 13, 11:59 PM – Final Deadline for P3**

# Milestone 1 Lab 1 (P1)

There are two major tasks to complete in your first lab period: team formation and problem exploration.

## P1 Task 1 : Team Formation

You have just met your new colleagues with whom you will work for the next six weeks. Get to know each other *informally* – Exchange phone numbers and emails. Tell each other about your backgrounds and your interests. There are good reasons to learn a bit about each other, such as:

* Where do you live? (Some people may need to travel in order to work together)
* Do you have a job? (Some people may have time constraints)

You must also get to know each other *formally*.

1. ITP Metrics – **Conflict Management Report**

**On your own and without interference from any member of your team:**

* 1. Hopefully, you have each received an email from the Dean’s office informing you that the “ECOR 1051 - PEER FEEDBACK AND TEAM DYNAMICS (term, year)” assessment has started.
     + If you have not received this email, please create your own account using your Carleton University email address, so that you can do today’s exercise. You should be offered to take the Conflict Management Assessment somewhere on the welcome page. Let your TA know, and we will work on getting it properly setup before the Peer Assessment at the end of Milestone 1.
  2. Click on the link in the email or go to ***https://www.itpmetrics.com/*** and sign in using your Carleton University email address.
  3. On the “Main Menu”, click on the link to take the “ECOR 1051 – Conflict Management” (term, year)” assessment.
  4. Complete Conflict Management assessment.
  5. **Download Report as PDF**
  6. Submit your PDF report on CULearn.

1. **Team Contract** –

**Together as a group:**

* 1. Download the Team Contract Template posted under Milestone 1. **Follow the instructions** within the contract, participate fully, spend time thinking about your answers, plan out all your meeting times and your conflict resolution strategies (using the information from your Conflict Management report in the previous step). Should conflict occur, the instructors will be using this contract to assess the situation and decide how to intervene.

See the Submission Summary for deadlines and requirements.

## P1 Task 2 – Project Understanding

As a group, watch the Video Depiction of your Final Project.

As a group, (re-)read the Project Overall Description. This document provides an overview of the project. You won’t need all of the information at this very moment, but the intention is to let you see the “big picture”, so you understand what program you will ultimately develop.

Do you have any questions about the project? Are there ambiguities? Do you see any upcoming challenges for group work? You don’t have to have all the answers now because some will come about as you begin to work, but make sure that everyone in the group has a common understanding.

There is no submission required

## P1 Task 3 - Problem Exploration – Understanding RGB Colour Representation

Our photo-editing program is based on the *RGB Colour Representation* for digital images. Your project begins by understanding RGB and in turn how this is programmed in Python.

There is an excellent online tutorial at <https://www.w3schools.com/colors/>. Take the time to explore this tutorial, including experimenting with all the examples that they provide (Try it Yourself). As explained there, colours are represented in several ways: RGB, Hexadecimal, HSL and HWB. **Read only the sections about RGB.** Introductory topics to read (on the left-hand menu) are:

* Colors HOME
* Color Shades
* Color RGB
* Color Hues (Hues, Tins, Shades and Tones)
* Color Picker
* Color Mixer
* Colour Converter

No submission of the code is required. It is expected that you complete these tasks as part of your project preparation

## P1 Task 4 – Coding Exercise to Learn CIMPL

Several 3rd-party Python libraries support image processing. We'll use Cimpl: ***C***arleton ***i***mage ***m***anipulation ***P***ython ***l***ibrary. This library contains a set of functions that let us load/save digital image files, retrieve and modify the colour of individual pixels, display images. The Cimpl library, in turn, uses Pillow to load images encoded in several popular formats (JPEG, GIF, PNG, etc.) and to store modified images in these formats

To get ready, follow along two posted files:

Text How-To: Getting Started with CimpL

* + The first portion of this document shows how to check whether your installation of Python, Wing as well as Pillow are up to date.
  + The second portion follows the same steps shown in the video (next).
  + Optional: Video How To: Getting Started with CimpL
* The third portion demonstrate a simple iteration of an image.

No submission of the code is required. It is expected that you complete these tasks as part of your project preparation.

Individually, complete the CULearn Quiz titled – **Understanding RGB**. The Quiz has a 15-minute time-limit. Do the reading in Task 3 and Task 4 before you begin.

# Milestone 1 Lab 2 (P2)

It is time to start writing your first image filters. In this lab, your task is to first understand what a “*channel*” is, and then to divide the work up so that everyone writes one filter each, along with a test function of that filter (in a standard group of four people).

## P2 Task 1 : Understanding the Design Solution of an Image Filter

A colour in the RGB colour model can be represented by a triplet of integer components, each of which ranges from 0 to 255. The first component is the quantity of red, the second component is the quantity of green, and the third component is the quantity of blue.

Each pixel in a display screen has three light sources placed close together, so we perceive them as a single "dot" in the display. One source emits red light, another emits green light and the third emits blue light. When a pixel is illuminated, the display hardware uses the RGB triplet for that pixel to set the intensity of light that is emitted from each of the three sources. Our vision system interprets the intensities of the red, green and blue light as one of the 16,777,216 colours that can be represented by an RGB triplet.

We can think of an RGB image as being composed of three overlapping monochromatic images (one consisting of shades of red, another consisting of shades of green, and the third consisting of shades of blue). These monochromatic images are often referred to as ​*channels*​. Three filters that you will reveal the separate red, green and blue channels in an image.

Image filtering is the process of changing or extracting one aspect of the digital image representation to make the image look different. For instance, a **red-channel** filter uses only the red channel of an image, clearing the blue and green channel. In contrast, a **green-channel** filter uses only the green channel of an image, clearing the red and blue channels. The effect of these two filters are shown below.

A dog running after a frisbee on a green field

Description automatically generatedA dog standing on top of a grass covered field

Description automatically generatedA picture containing dog, grass, outdoor, red

Description automatically generated

## P2 Task 2 : Understanding the Four Required Filters

In Milestone 1, you will write four of the simplest image filters, to be called respectively:

* red\_channel
* green\_channel
* blue\_channel
* combine

Hopefully, from Task 1, you understand now what the red/green/blue\_channel filters should do. What about the combine filter? Look at Figure 1. On the left is an input image, for example, called p2-original.jpg. That same image is passed as the input parameter to each of the three xxx\_channel() filters, producing three single-channel output images. Those three images now become the three input parameters to the combine() filter. If you have coded everything correctly, the CombinedImage.jpg should be identical to the p2-original.jpg. We shall be able to – at a glance – know whether your software worked.

p2-original

(.jpg)

red

channel

(.jpg)

green

Image

(.jpg)

blue

Image

(.jpg)

Combined

Image

(.jpg)

red\_channel ()

green\_channel ()

blue\_channel ()

combine ()

Figure Workflow for Milestone 1's Image Filters

## P2 Task 3 : Writing your First Image Filter(s)

There are four filters (i.e. functions) and in most groups, there are four members.

The leader of the group shall:

1. Ensure that everyone understands the task to be completed, including the premise of the technical solution. The leader of the group does not need to be the expert and “have the solution”; instead, the leader must ensure that each member is empowered to do their portion of the work.
2. Delegate who is doing which filter.
3. At the end, when everyone has completed their portion, coordinate the amalgamation of the individual pieces of the solution into one group solution.
   1. Required Filename: **xxx-P2-channel-filters.py**

Each individual shall :

* Follow the FDR to construct their assigned filter.
  + The filter’s function must not destroy the original image. It must create a new image that is a copy of the original image, with appropriate changes
    - Required Filename: **xxx**-**P2-yyy.py** where **xxx** is your CULearn group identifier and **yyy** = {red, green, blue or combine)
* Within your file, test your filter’s function using the images supplied on the CULearn course page, and by writing a **test function**
  + You can test your image by showing the image. Showing the image is the most fun way to verify that your program is working. That’s what so fun about working with images – you get immediate visual feedback when your image turns red or green or blue.
  + You must also **automatically** test (verify) your filter by writing a corresponding test function. This test function must verify that each pixel is correct, where “*correct*” is defined by your particular function.
    - Example: For the red\_channel() filter, all pixels must have zero green and blue components
    - Example: For the combine() filter, each pixel must have the red,green,blue pixel from the same location in the red,green,blue image, respectively.

**Tip:** The person who writes the combine() filter does not need to wait until the others have completed their work. Single-channel images are provided on CULearn, in the folder containing CImpl and Approved Sample Images (they are called red\_image.jpg ,etc for p2\_original.jpg)

When **all** group members have completed their task – as a group – demo your work to the TA.

1. Create a file called **xxx-P2-channel-filters.py.**
2. Copy-paste every one’s code into this one file.
3. Make sure it still compiles and runs.
4. As a group, call over the TA to demonstrate your work. Make sure that each individual identifies themselves to the TA and demonstrates their own portion of the program.

See the Submission Summary for deadlines and requirements

* **The docstring of each function must include the name of the primary author of the function.**

# Milestone 1 Lab 3 (P3)

The third milestone is a time to wrap-up the first portion of the project, by documenting the project and evaluating the team performance thus far. In addition, if needed, you can demo your final code submission, if not already done so.

It is strongly recommended that you start working on both tasks **before** this lab.

## P3 Task 1 : The Project Report (aka Engineering Solution)

You are required to write a **Project Report** (approximately 2 pages) that describes your understanding of the problem and how you will write a program to solve this problem.

**Instructions and sample report – TBD (Coming soon). Keep checking CULearn for updates.**

It is strongly recommended that you prepare a draft of your report **before** coming to the lab, so that you can get some early feedback from your TA.

## P3 Task 2 : ITP Metrics

You will complete the  **Peer Feedback and Team Dynamics assessment .** You complete these assessments individually, but the results are combined by ITP Metrics into an overall assessment of the team.

**On your own and without interference from any member of your team:**

1. Login into your account on ITP Metrics.
2. Individually, complete the **Peer Feedback** and **Team Dynamics Assessment**.
3. Once all team members have completed the assessment, a report will be generated and sent to you by email.
   1. ITP Metrics will not generate this report until all team members have completed their portion.
   2. If you have a missing team member or someone is absent, you will have to contact the instructor to override this feature. Your instructor may not reply for 1-2 days; consequently, it is strongly recommended that you begin this task **before** coming to your lab if you foresee any problems with your team members.
4. Go back to ***https://www.ipmetrics.com/*** and sign in again, if necessary.
5. Individually, download both fillable PDF reports related to this assessment.

* Individually, in the **Peer Feedback** report, fill in **ALL** the designated areas on each page directly in the fillable PDF except the “Team Debrief” section (this will be done as a team later) and print your report containing your answers as a PDF.
* Individually, in the **Team Dynamics** report, fill in **ALL** the designated areas on each page directly in the fillable PDF and print your report containing your answers as a PDF.

**As a group – after each member has completed their own two reports**

1. Read together the **Team Debrief: Purpose & Guidelines** (probably around Page 10)
   * You will each have this same page in your own individual reports. Follow along together.
2. Together, follow the **four steps** listed in the report. (probably around Page 10)
   * The team leader should play the role of facilitator.
   * Each person should record the discussion in their own report (probably on Page 11)

Each individual shall then submit their own two PDF reports on CULearn.