Image Processing and Computer Vision

Course Introduction

(MQF Level 6)

ITIMG-606-1601

E. Farrugia, P. Pulis, D. Scerri

Unit Description

- This unit gives a basic yet solid understanding of Image Processing techniques,
- It also provides some examples of its application in the rapidly-developing area of Computer Vision.
- Computer Vision is presently known to be a difficult problem, due to the complexities involved in the human vision system
- In order to be appreciative of what are the intricacies involved, we will also be covering some details on the human vision system and we will also see how this correlates to computer vision.
- Computer Vision is finding its way through many sectors such as security, health, and entertainment
- Methods of acquiring data (digital images and videos) have become even more available and affordable.
- You will also be designing and developing your own implementations as we go along.
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Deliverables

- By the end of this unit you will cover a vast array of topics some of which are mentioned below. The unit first introduces the theory behind
  - **Image Processing**
  - **Computer Vision**
- The application of fundamental operations in Image Processing, such as
  - **Image Filters**
  - **Histograms & Equalisation**
- These fundamental operations used in more complex problems, such as
  - **finding edges**
  - **finding corners**
  - **finding other interest points**
  - **finding shapes in the image.**
- Finally, some typical problems of Computer Vision will be examined. These include
  - **object detection**
  - **recognition**
  - **tracking.**

Pre-Requisites

- Ability to use a paint application (such as Adobe Photoshop , or Fireworks)
- Good Knowledge of Python. (v.3.6)
- Be able to research on own initiative.

  You are recommended to look up and create things by yourself if you really want to succeed. Self-initiative is very important.

Required Software

- A paint application of your choice (recommended: Adobe Fireworks or Photoshop). These will not be covered in the unit however will be very useful when it comes to edit your graphics / resize them or change image formats. A frequently used file format is .png so make sure that the application you use supports this format along.ico and .jpg (which might also come in useful)
- **Octave:** this is software featuring a high-level programming language, primarily intended for numerical computations. Octave helps in solving linear and nonlinear problems numerically, and for performing other numerical experiments. Since it is part of the GNU Project, it is free software under the terms of the GNU General Public License.
- Python 3.6 + OpenCV (*Open Source Computer Vision*)

  -Links and setup guides available on Moodle

Assessment

- Assessment will be based on coursework.
- At the end of every part, a coursework will be required to be completed. Class-based practical sessions will be held on IP concepts & image matrices, filters, histograms and binary images, with a total weighting is 46%
- At the end of part 2, you will be required to present your fully functional application which has a weighting of 54%. Deadline of this assignment is 17th January 2018
- The applications submitted will be cross-verified against peer classes and you will also be subject to an interview to verify that you are actually knowledgeable about what you are presenting.
- At the end of the unit there will be a Synoptic (which will be a class assignment and will be held at the end of Semester
- Copying or non submission of work will automatically lead to failing the unit.