

# Digital Image Processing Using LabView

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## 1. Introduction

Digital Image processing is a topic of great relevance for practically any project, either for basic arrays of photodetectors or complex robotic systems using artificial vision. It is an interesting topic that offers to multimodal systems the capacity to see and understand their environment in order to interact in a natural and more efficient way.

The development of new equipment for high speed image acquisition and with higher resolutions requires a significant effort to develop techniques that process the images in a more efficient way. Besides, medical applications use new image modalities and need algorithms for the interpretation of these images as well as for the registration and fusion of the different modalities, so that the image processing is a productive area for the development of multidisciplinary applications.

The aim of this chapter is to present different digital image processing algorithms using LabView and IMAQ vision toolbox. IMAQ vision toolbox presents a complete set of digital image processing and acquisition functions that improve the efficiency of the projects and reduce the programming effort of the users obtaining better results in shorter time. Therefore, the IMAQ vision toolbox of LabView is an interesting tool to analyze in detail and through this chapter it will be presented different theories about digital image processing and different applications in the field of image acquisition, image transformations.

This chapter includes in first place the image acquisition and some of the most common operations that can be locally or globally applied, the statistical information generated by the image in a histogram is commented later. Finally, the use of tools allowing to segment or filtrate the image are described making special emphasis in the algorithms of pattern recognition and matching template.

## 2. Digital image acquisition

We generally associate the image to a representation that we make in our brain according to the light incidence into a scene (Bischof & Kropatsch, 2001). Therefore, there are different variables related to the formation of images, such as the light distribution in the scene. Since the image formation depends of the interaction of light with the object in the scene and the emitted energy from one or several light sources changes in its trip (Fig. 1). That is why the

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