Chapter 73
Mobile Applications for Automatic Object Recognition

Danilo Avola
University of Udine, Italy

Gian Luca Foresti
University of Udine, Italy

Claudio Piciarelli
University of Udine, Italy

Marco Vernier
University of Udine, Italy

Luigi Cinque
Sapienza University, Italy

ABSTRACT

In recent years, the technological improvements of mobile devices in terms of computational capacity, embedded sensors, natural interaction, and high-speed connection are enabling an ever-increasing number of designers to develop advanced mobile applications to be used in everyday life. Among these, the vision-based applications for the automatic object recognition (AOR) play a key role since enabling users to interact with the world around them in innovative way makes more productive and profitable their entertainment, learning, and working activities. The chapter is divided into four sections. The first one, "Background," explores the most recent works in AOR mobile applications highlighting the feature extraction processes and the implemented classifiers. The second one, "MV Development Technologies," provides an overview of the current frameworks used to support the mobile AOR applications. The third one, "Future Research Trends," discusses the aims of the next generation of AOR applications. Finally, "Conclusion" concludes the chapter.

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INTRODUCTION

In recent years, the technological improvements of mobile devices in terms of computational capacity, embedded sensors, natural interaction and high-speed connection are enabling an ever-increasing number of designers to develop advanced mobile applications to be used in everyday life. Among these, the vision based applications for the Automatic Object Recognition (AOR) play a key role since enable users to interact with the world around them in innovative way that makes more productive and profitable their entertainment, learning and working activities. Within the introduced topic, objects can be physical entities of any type, from small sized objects (e.g., paintings, statues) up to medium sized objects (e.g., road signs, vehicles) or large sized objects (e.g., airplanes, buildings). The real step forward in moving the AOR from the common Computer Vision (CV) paradigm to that of the Mobile Vision (MV) is the ability to perform, with a mobile device, the recognition and classification of objects both in pervasive way (i.e., anywhere, anytime) and in indoor as well as outdoor environments. Up to about ten years ago, the only way to recognize an object of the real world acquired by an RGB mobile camera in outdoor environments was the adoption of visual expedients (e.g., markers, barcodes) which, once recognized, contained all the required information of the target object. Although it is still an open issue, the recent advances in image quality, image feature extraction and image classifiers make possible the automatic recognition of an ever-increasing number of objects. Nowadays, there are many AOR applications that support a wide range of popular fields (e.g., culture, tourism, food). In addition, recently, an ever-increasing number of AOR applications aimed in supporting professional fields (e.g., forensic, architectural, engineering, medical) have been developed. The proposed chapter is divided into four sections. The first one, Background, introduces a taxonomy of the current mobile applications and explores the most recent works in AOR mobile applications highlighting crucial aspects of the object recognition algorithms, including the feature extraction processes and the implemented classifiers. The second one, MV Development Technologies, provides an overview of the current frameworks used to support mobile AOR applications. The third one, Future Research Trends, briefly discusses the aims of the next generation of AOR applications. Finally, the last one, Conclusion, summarizes what has been reported in the present chapter.

BACKGROUND

In the last decade, mobile devices have had ongoing and growing technological advances. Currently these devices, even those of low cost, have a set of hardware features that make them comparable with a wide range of desktop processing units. In fact, these mobile devices, with particular reference to those of the latest generation, present a set of significant improvements, including:

- **Multi-Core Processor (MCP):** A single processor that contains several cores. This technology typical of common processing units (e.g., workstations, servers) allows mobile devices to rapidly process a large amount of data also improving the performance of running multiple applications.
- **Advanced Storage Capacity (ASC):** A large amount of internal memory and the possibility to adopt external memories (e.g., compact flash, memory stick). This technology allows mobile devices to support both complex data and bulky applications.