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An Introduction to Object Recognition

Selected Algorithms for a Wide Variety of Applications

Rapid development of computer hardware has enabled usage of automatic object recognition in an increasing number of applications, ranging from industrial image processing to medical applications, as well as tasks triggered by the widespread use of the internet. Each area of application has its specific requirements, and consequently these cannot all be tackled appropriately by a single, general-purpose algorithm. This easy-to-read text/reference provides a comprehensive introduction to the field of object recognition (OR). The book presents an overview of the diverse applications for OR and highlights important algorithm classes, presenting representative example algorithms for each class. The presentation of each algorithm describes the basic algorithm flow in detail, complete with graphical illustrations. Pseudocode implementations are also included for many of the methods, and definitions are supplied for terms which may be unfamiliar to the novice reader. Supporting a clear and intuitive tutorial style, the usage of mathematics is kept to a minimum. Topics and features: presents example algorithms covering global approaches, transformation-search-based methods, geometrical model driven methods, 3D object recognition schemes, flexible contour fitting algorithms, and descriptor-based methods; explores each method in its entirety, rather than focusing on individual steps in isolation, with a detailed description of the flow of each algorithm, including graphical illustrations; explains the important concepts at length in a simple-to-understand style, with a minimum usage of mathematics; discusses a broad spectrum of applications, including some examples from commercial products; contains appendices discussing topics related to OR and widely used in the algorithms, (but not at the core of the methods described in the chapters). Practitioners of industrial image processing will find this simple introduction and overview to OR a valuable reference, as will graduate students in computer vision courses. Marco Treiber is a software developer at Siemens Electronics Assembly Systems, Munich, Germany, where he is Technical Lead in Image Processing for the Vision System of SiPlace placement machines, used in SMT assembly.

Object recognition has been an area of extensive research for a long time. During the last decades, a large number of algorithms have been proposed. This is due to the fact that, at a closer look, "object recognition" is an umbrella term for different algorithms designed for a wide variety of applications, where each application has its specific requirements and constraints. This book demonstrates the diversity of applications and highlights some important algorithm classes by presenting representative example algorithms for each class. This book is written in a tutorial style and is therefore suitable as an introduction into the field of object recognition for interested readers who are not yet experts. The presentation of each algorithm focuses on the main idea, which is described in detail, and avoids extensive usage of mathematics. Graphic illustrations of the algorithm flow facilitate understanding. The algorithms presented are classified according to the following categories: global approaches, transformation-search-based methods, geometrical model driven methods, 3D object recognition schemes, flexible contour fitting algorithms and feature-based methods. Typical example algorithms are presented for each of the categories.
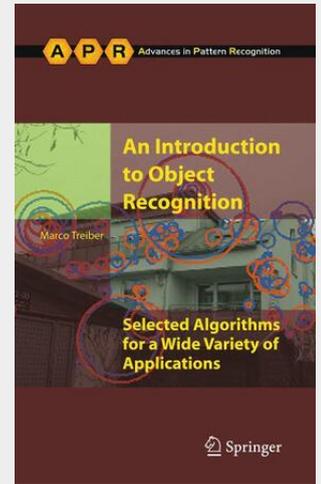
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