

# Preface

Since the publication of the first edition of our book in 1999, machine vision has enjoyed continuous strong growth as in the decade before. After machine vision had crossed the 1 billion Deutsche Mark revenue line in Germany in 2000, the same euro milestone was then reached in 2005. The average growth rate was approximately 6.4 % between 2000 and 2010 [VDMA (German Engineering Association)]. One has to look carefully to find industries with comparable growth dynamics.

However, this glossy image has experienced its first setbacks. In 2009 in the wake of the global economic crisis, companies in this industry suffered significant losses (−21 %) for the first time.

In addition to this, machine vision had by now reached the phase of a “consolidated industry” in the life cycle of an economic sector. The spirit of optimism from the 1990s has mostly evaporated, technological quantum leaps have become rare, and by now the continuous reduction of system cost is at a premium. Start-ups can only establish themselves on the market with the help of huge grants and only rarely do they leave the “small business” sector. On the other hand, the number of co-operations is increasing and many market players are growing solely by purposefully acquiring smaller businesses.

Where in the 1990s a complex algorithm was able to convince on the spot, today software reliability during continuous production and trouble-free integration into networked production structures are vital.

Since all industry partners feel the increasing time pressure, intelligent easy-to-use functionality becomes more and more important. Wherever possible, system providers have to use high performing hardware and software standards since the development of proprietary systems is no longer acceptable to the market, neither technologically nor financially.

However, the subject retains its fascination and there is a number of reasons why, globally, machine vision will continue to grow successfully over the following years.

Ensuring quality is the top priority among manufacturers. Machines that are able to “see” gauge high-precision parts, guide robot arms into the correct position, and identify components during production flow from incoming to outgoing goods.

Let us summarize: today, industrial production without machine vision is unthinkable! Therefore, visual inspection systems can be found in businesses of all sizes and industrial sectors.

Especially German industry with its strong “Mittelstand” (medium-sized businesses) again and again holds numerous very different and demanding tasks for machine vision. Hence, German machine vision businesses are globally leading in many areas, especially when it comes to versatility, flexibility and integration into various production environments. Excellent competence with regard to solving the image processing task is the fundamental requirement to be seriously taken into consideration as a provider. With this background, a practical introduction into image processing is now more needed than ever before.

This book is based on years of practical experience on the part of the authors in development and integration of automated visual inspection systems into manufacturing industry. We have tried to use a different approach than most books about (digital) image processing. Instead of introducing isolated methods in a mathematically systematic sequence, we present applications taken with few exceptions from industrial practice. These image processing problems then motivate the presentation of the applied algorithms, which focuses less on theoretical considerations than on the practical applicability of algorithms and how to make them work together in a consistently designed system. The mathematical foundations will not be neglected, of course, but they will also not be the main focus of attention.

We hope that this approach will give students and practitioners alike an impression of the capabilities of digital image processing for the purposes of industrial quality control. We also hope that it will create an understanding for the prerequisites and methodology of its application.

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