

Preface to the Second Edition

Creating the Second Edition of the Handbook of Iris Recognition is somehow more challenging and ambitious than creating the first edition. This is because iris recognition continues to develop simultaneously in both practical applications and fundamental research. On the practical application side, iris recognition is increasingly used with success in demanding, large-scale applications. Perhaps, the most prominent example of this is the Aadhaar program administered by the Unique ID Authority of India. Over one billion persons have already been enrolled in the Aadhaar program. This is over three times the population size of the United States! The Aadhaar program registers people with both fingerprint and iris. A report from the Center for Global Development compared fingerprint and iris recognition results from the program and stated—“UID’s data suggest that iris scans are far more inclusive than fingerprints ... They are also more precise for authentication, in terms of having a lower tradeoff curve between errors of acceptance and rejection.” This sort of comparison statement would once have been highly controversial, but now seems broadly accepted. Another long-running application of iris recognition is the United Arab Emirates’ border-crossing application that has been in place for well over a decade. And a more recent application is the use of iris recognition to create a duplicate-free voter registration list for new elections in Somaliland.

On the research side, many fundamental and fascinating questions are being addressed in the research community. Advances on these topics hold the promise of improving future applications of iris recognition. A number of current topics in the iris recognition research community have the aim of improving the use of iris recognition at high accuracy for whole populations. Examples of this can be seen in new chapters added to the Second Edition, authored by Czajka, by Nigam, Vatsa and Singh, and by Bolme and coworkers.

The new chapter by Czajka explores the issue of “liveness testing” for iris recognition, based on the dynamic nature of the pupil. The new chapter by Nigam, Vatsa, and Singh explores and catalogs various eye conditions that will be encountered in serving whole populations, and discusses the effects of these

conditions on iris recognition. The new chapter by Bolme and coworkers looks in depth at the issue of correcting for images where the iris is seen in an off-angle view. The new chapter by Rathgeb and coworkers gives a system-level view of the flow of processing in an iris recognition system, along with an introduction to the open-source implementation provided by their lab. The revised chapter by Proença updates the corresponding chapter that appeared in the first edition. Proença is research community's best-known advocate in the for performing iris recognition using visible-light images rather than near-infrared images, and exploiting the use of visible-light imaging to allow less-constrained image acquisition.

The new iris segmentation chapter by Jillela and Ross also updates a corresponding chapter in the first edition. In many ways, the potential for improvement in iris recognition accuracy seems to be greater through improvements in segmentation than through improvements in coding or matching. This chapter gives an appreciation of the difficulty of the problem as well as of the current state of the art. The new chapter by Galbally and coworkers replaces the corresponding chapter in the first edition. This chapter is an excellent example of the collaborative spirit in the iris recognition research community. The two major research groups in the area of iris image reconstruction from iris codes have teamed up to provide an introduction to the state of the art on this topic.

Organization and Features

As already mentioned above, there are four new chapters added to the Second Edition of the Handbook of Iris Recognition. This results in over 100 pages of new material. In addition, four other chapters have undergone major revision and updating, resulting in another 100 pages of revised material. The result is a combination of broader coverage of topics than in the first edition, as well as deeper coverage of selected topics.

This Second Edition of the Handbook of Iris Recognition includes a Foreword by the Father of Iris Recognition, Professor John Daugman, along with 23 contributed chapters. The 59 contributing authors come from a wide range of different companies, government agencies, and universities. They also come from many different countries, including Austria, Canada, Denmark, Germany, Hong Kong, India, Lithuania, Poland, Portugal, Singapore, the United Kingdom, and the USA.

Target Audiences

There are multiple target audiences for the Handbook of Iris Recognition, brought together by the theme of needing a better understanding of the current state of the art in this field. Anyone new to the field of iris recognition and needing to quickly get a big-picture view of the field should find the Handbook quite useful.

Any potential consumer of iris recognition technology wanting a sober appraisal of the current state of the art should find it here. Any researcher looking for ideas of where and how to usefully advance the state of the art in iris recognition should find a wealth of ideas here.

Acknowledgments

Special thanks are due to authors of chapters in the first edition who took on the task of revising and updating their chapter: Hugo Proença for the chapter on visible-light iris recognition, Raghavender Jillela and Arun Ross for the chapter on methods for iris segmentation, and Javier Galbally, Marios Savvides, Shreyas Venugopalan, and Arun Ross for the chapter on iris image reconstruction from binary templates. Special thanks are due as well to the authors of new chapters: Adam Czajka for the chapter on iris liveness detection, Ishan Nigam, Mayank Vatsa, and Richa Singh for the chapter on the menagerie of ophthalmic disorders that affect iris recognition, Christian Rathgeb, Andreas Uhl, Peter Wild, and Heinz Hofbauer for the chapter on design decisions for an iris recognition SDK, and David S. Bolme, Hector Santos-Villalobos, Joseph Thompson, Mahmut Karakaya, and Chris Bensing Boehnen for the chapter on methods of correcting off-angle iris images. All of these authors have done an excellent job of improving the coverage and quality of the Handbook.

We again thank our editors at Springer for their patience and encouragement. We again would like to thank our families for their support over the evening and weekend time needed to make the Handbook a reality.

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Preface to the First Edition

Iris Recognition became a practical area of technology and study with John Daugman's pioneering work about two decades ago. The development of the field was at first slow, but has expanded dramatically in recent years. There are now various national identity schemes in progress that make use of Iris Recognition technology. There is also a large and vibrant research community focused on Iris Recognition, studying ways to make it even more accurate in even larger scale applications. The primary goal of this book is to give an authoritative introduction to the current state of the art in Iris Recognition technology. The field has already, in large part, moved past the study of alternative segmentation algorithms and texture filters applied to pristine iris images. One major current emphasis is how to deal with varying quality iris images acquired with less-explicit user cooperation. Another major current emphasis is on methods for improving accuracy in the context of varying quality images. Still another major current emphasis is on a better understanding of the basic science underlying iris recognition. Each of these emphases is represented by multiple chapters in this book.

Organization and Features

This book includes a Foreword by Professor John Daugman, along with a collection of 17 chapters contributed by researchers from around the world. It includes theoretical studies, such as the chapter by Clark, Culp, Herron and Ross on Iris Dynamics and the chapter by Kong, Zhang and Kamel on the Iris Code. It also includes very empirical studies, such as the chapter by Baker, Bowyer, Flynn, and Phillips on Iris Template Aging and the chapter by Phillips and Flynn analyzing results from the Iris Challenge Evaluation 2006. The 44 authors contributing to the book come from companies, government agencies, and universities. They also come from many different countries, including Lithuania, Canada, Singapore, Denmark, Portugal, Hong Kong, the United Kingdom, and the USA.

Target Audiences

The target audience for this book is anyone who wants a better understanding of the current state of the art in Iris Recognition. Practitioners in industry should find new insights and possibilities in the breadth of topics covered. Managers and executives in government should find a more sober appraisal of the field than that exists in the marketing literature of the industry. Researchers in government, industry, and academia should find new ideas for productive research efforts.

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