

Preface

The human face plays an important role in daily life. Pursuing beauty, especially facial beauty, is the nature of human beings. As the demand for esthetic surgery has increased tremendously over the past few years, an understanding of beauty is becoming utmost important for medical settings.

The physical beauty of faces affects many social outcomes, such as mate choices and hiring decisions. Facial beauty analysis is an emerging topic. The study of facial beauty has attracted efforts of researchers from diverse fields. However, most existing works focus on verifying the relevance between predefined characteristics and facial beauty, and they are far from adequate for developing application systems. Recently, computational facial analysis has been developed rapidly and is successfully used in applications of face verification, expression recognition, age estimation, etc. Besides a couple of methods, algorithms and schemes in general computational facial analysis communities can be applied to facial beauty analysis. Many new ideas, specialized methods and research paths have been proposed in this field. Of course, there have been sufficient new research outputs on facial beauty analysis and it is meaningful to summarize them including the newest research advance, technical means, experimental analysis, and results as well as possible applications of them.

This book is based on our research work and has the following background: previous studies on facial beauty analysis have drawbacks. Though experimental evaluation based on large-scale databases is very important for demonstrating the performance of beauty analysis methods and schemes, it seems that some of previous studies lack sufficient experiments and definitely convincing experimental results. In addition, though various studies including ideas, methods, and schemes on facial beauty are available, there are no very comprehensive comparison and testing under a fair and benchmark condition. In addition, almost all previous studies did not provide practical facial beauty analysis systems.

One of main focuses of this book is on computer models for facial beauty analysis. Moreover, our goal is to make more objective and quantitative analysis of facial beauty. As a result, all studies are based on the well-defined metric,

quantitative algorithms, and procedures. Compared to most of previous works, our studies lay much emphasis on data-driven research as well as evidence—and seriously experimentally tested—based facial beauty analysis. Large-scale database-based and repeatable experiments are another characteristic of our studies. Main aspects of our novel studies include the proposed new hypotheses, computationally efficient mathematical models and algorithms, and serious experimental evaluation. Moreover, all putative rules on facial beauty perception used in previous and our studies are fairly tested with biometric techniques and large databases. In the book, detailed descriptions on methods, schemes, and procedures of our studies allow readers to grasp well and easily apply them.

This book explores the secrets of facial beauty with a computational perspective and also provides the following techniques that are used in our facial beauty analysis: face image processing, facial landmark extraction, face representation, face image warping, and soft biometrics. Since the facial beauty is measurable, and there have been a long period of facial beauty studies, the book first introduces previous works including hypotheses, definitions, evidences, and experiments. Then the book turns into a systematic introduction to our studies, including the idea, hypotheses, scientific means, computational results, and conclusions. The comparison between previous and our studies is also included. Finally, we present a facial beauty analysis system designed by our research team and make a prospect for future work.

The book is organized into five main parts. Part I briefly introduces the basic concepts and some typical facial beauty analysis methods. Part II presents some useful features and face models on facial beauty study. Moreover, feature selection and fusion methods related to our study are also presented in this part. In Part III, some hypotheses based on facial beauty perception methods are described. Some computational models of facial beauty analysis are defined in Part IV. The final part shows an online facial beautification simulation system and makes a conclusion for the book.

This book will be beneficial to researchers, professionals, and postgraduate students working in the fields of computer vision, pattern recognition, biometrics, multimedia, etc. The book will also be very useful for interdisciplinary researchers.

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