

Preface

The book I am introducing with Professor Tomomasa Nagashima is on the principles and applications of biometrics (BM) and Kansei engineering (KE) and their techniques. For the first time, biometrics and Kansei engineering are combined together in one book. The idea did not come incidentally. Biometrics in future will imply new technologies that will depend on people's emotions and the prediction of their intention to take an action. For pervasive or ubiquitous networks, we need real-time human–computer interactions. Actually, KE is becoming the complementary part of BM in these as well as other aspects. The authors are indeed indebted to Professor Ryszard Tadeusiewicz for his steady support toward both fields of biometrics and Kansei engineering in Poland and Japan through his lectures, consultation, and worthy advice on many issues.

Biometrics is divided into two categories: physiological (the body features we are born with) and behavioral (or psycho-behavioral as Kansei experts call it). Behavioral BM deals with our behavior – the way we walk, the way we talk, and the way we express our emotions.

Kansei engineering, however, as stated by Professor Tomomasa Nagashima, who I call the godfather of KE, is concerned with the interactions between users and products/services. One of its major activities is focused on the product psychology – engineers need to design the product in accordance with the comfort of the users; hence, they test the reaction of people toward certain products (car interiors, for example). Accordingly, the response of the driver (in the case of cars) can be quicker or more certain toward sudden changes if the dashboard is designed to be user-friendly, well seen with the good relation between car computer and human. The reaction and behavior of individuals certainly differ from person to person based on their personal emotions and character or their exact behavioral biometrics. This is only one real example, which will be studied in detail in the book.

The subject of the book is introduced through two parts: biometrics and Kansei. In the biometrics part, there are eight chapters that cover most of the basic biometrics applications. Principles and new concerns are explained in Chap. 1 and face recognition in unconstrained environment in Chap. 2. Chapter 3 covers a thorough study on iris recognition independently of its rotation angle. Some

medical details about the iris anatomy and possible iris diseases are given in this Chap. 3 for a knowledge of the error sources in iris recognition. Consequently, a new mathematical model based on Fourier descriptors was worked out to deal with the iris image under different conditions, particularly with the most difficult problems that result from its deformation and rotation. Human identification by their vascular vessel pattern with the help of the finger vein model is given in Chap. 4. Chapter 5 deals with the operation principles of touch screen dynamics and its user identification studies. These five chapters have been neatly prepared by my team of biometrics in AGH University of Science and Technology in Kraków. The other three chapters of Part I of the book present interesting new aspects in biometrics and have been very well prepared by internationally known biometrics research groups from Japan, USA, and Canada. Chapter 6 shows new methods of biometric identification based on eye movement, the three-dimensional shape of the iris surface, and the contour of the eyelid during blinking. New effective pattern descriptors in eye detection are given in Chap. 7. Chapter 8 introduces a complete discussion on chaotic neural networks and multidimensional data analysis in biometrics.

The Kansei part of the book consists of six chapters (Chaps. 9, 10, 11, 12, 13, and 14) which involve definitions and principles of KE and its essential techniques in some interesting and very important fields and applications in our life. Chapter 9 presents a general description and introduction to the scientific field Kansei Engineering. Chapter 10 discusses the role of KE as a postmodern technology. In Chap. 11, the role of empathy in KE is highlighted among the various concepts in Kansei – an aesthetic thought is introduced. Chapter 12 deals with the methods of measuring Kansei, which involve the techniques for assessing mental and physical states from facial expressions those for assessing closing comfort via physiological responses. Chapters 13 and 14 deal with Kansei from the viewpoint of information technologies. An information-theoretical approach to Kansei is given in Chap. 13 through the relation between Bayesian updating using the notion of binary channel and sequential probability ratio test (SPRT). Chapter 14 also introduces computer agent modeling based on Ontology and a Bayesian network as applied to human care problems.

Thus, through these works, it will be shown how the two parts of BM and KE relate to each other, proving that a closer coordination between them can help study systematically the user's behavior and the feedback to the contiguous computer.

Moreover, some current studies in Kansei allow the association of biometrics features or personal emotion patterns with possible odd states and/or diseases. The KE achievements, for example, are developing such facilities for studying the reason why an infant or a child cries. By analyzing the cry signal, it should be known if it is a call for food or the baby is sick, frightened, or simply feels lonely.

From another viewpoint and for the health and safety of people, according to my own observations and thus my suggestions, cars should have microphones and cameras embedded in the doors and ceiling (in a similar way to air bags or air curtains) that operate immediately after an accident or a similar need. This would allow the car computer to register the current state of the driver and the passengers

(their behavior and emotions, if they are shouting or crying, or what they are saying) when they are unable to communicate at all. The car computer then is supposed to send the appropriate information to the nearest hospital, police, or the nearest cars and their drivers and/or computers.

This is, thus, the benefit of using Kansei ideas and basics in biometrics applications and domains for a more comfortable, propitious, and safe life.

A number of scientists and researchers have contributed in reaching the main goals of this book and stand behind its prosperity. The authors hence are indebted to all of them who have contributed to this work and made the book of benefit for other researchers.

Together with Professor Nagashima, I am grateful to all the reviewers of both BM and KE chapters for their constructive comments and critical remarks that made the chapters palpable and readable. In particular, we express our sincere thanks to Professor Toshio Kuwako at Tokyo Institute of Technology, Professor Toshi Kato at Chuo University, Professor Huang Huming at the University of Calgary, Professor Kevin Jia at International Game Technology, and Professor Qinghan Xiao at Defence R&D Canada. They indeed devoted their precious time and carefully put in their efforts to get the result we have.

Finally, I hope the book will add a significant aspect to the scientific literature for the research teams in their current and future fundamental investigation challenges in biometrics and Kansei engineering.

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