Dengpan Mou

Machine-based Intelligent Face Recognition

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With 58 figures

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Author
Dengpan Mou
Harman/Becker Automotive Systems GmbH
Becker-Goering-Strasse 16
D-76307, Karlsbad
Germany
E-mail: dengpan.mou@harman.com

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Preface

We can't solve the problems by using the same kind of thinking we used when we created them.
Albert Einstein (1879−1955)

State-of-the-art machine-based face recognition technology, although booming since last decades, is still suffering a lot from critical research challenges, such as the lack of fundamental intelligence, the difficulties of running completely automatically and unsupervisedly without separate training, and the typical failures of dealing with free face pose variations, etc. Those limitations greatly hinder the wide applications it could have had. This book is the first to discuss the general engineering methods of imitating intelligent human brains for video-based face recognition. The advances and evidences from the cognitive science research are introduced in this book, which further strengthen our thoughts and proposals to achieve such a fundamental intelligence in machine vision.

Regarding intelligence, we have defined two directions. The first effort is to simulate the ability of self-learning, self-matching and self-updating. This side of intelligence can be detailed into the following features: the whole recognition procedure is running in an unsupervised, automatic, non-invasive, and self-updated way. It is important to note that, the fully automatic procedure is a generalized face recognition procedure, which includes the task of enrollment (training) and updating as well. However, those steps are typically separate and supervised in machine learning, and therefore missing the essentials of intelligence.

The other main focus of the book is to explore the novel ways on how to implement the high-level analysis in machine-based face recognition, to simu-

late the process in human brains. Through high-level analysis, it is possible to combine multiple available methods, which include conventional machine learning algorithms, image processing approaches, predefined rules, video context, temporal and spatial correlations and even logic deduction. The fusion of multiple approaches contributes significantly to the improved face recognition performance.

Experiments are made through long-term (over years) constructed sequences with more than 30 specific subjects and more than 20 faces from TV news channels. The evaluation results demonstrate the robustness of the proposals in unconstraint video scenarios.

The objective of the author is to provide this book for scientists, researchers and students in the areas of machine-based face recognition. The fundamentals and research backgrounds are provided, aiming to help the beginners to quickly step into the field. Introduction and analysis of the state-of-the-art technology can assist experts to easily keep up to date with the world-wide overview.

The author does hope that the proposals to achieve both intelligence and robustness could be somehow helpful for other researchers, to finally popularize the technology, and to pervasively apply it for designing general machine learning algorithms.

Dengpan Mou
Villingen-Schwenningen, Germany
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