

## Chapter 8

# Conclusion

This book collects available results on PHDs and MAPs and, in particular, it presents several of the available methods to determine the parameters of a PHD or MAP in order to capture the behavior of a real system described in form of some measurements. Our goal was to provide an application oriented presentation that helps to apply available techniques in practical modeling. We hope that the book helps a reader to solve her or his modeling problems when complex processes, which are common in many systems, have to be modeled and analyzed.

PHDs and MAPs have a great potential in describing real processes but the parameter fitting problem is still a complex optimization problem and we cannot claim that the resulting problems are all solved by the available methods. Nevertheless, practical experience shows that even multimodal distributions can be closely approximated by PHDs for which the parameters have been determined using one of the methods presented in this book. The situation for modeling stochastic processes is less advanced, since the parameter fitting problem for MAPs is still a challenge. However, currently available methods often give good results and require an acceptable effort.

The field of Markov models to approximate distributions and stochastic processes is very wide and we cannot provide an exhaustive overview of the whole area. There are some other overview papers [2, 3, 62, 76] and a huge number of research papers spread over different fields like computer science, applied mathematics, statistics and operations research. We hope that we mentioned the most important application oriented papers in the text, but for sure we forgot some.

The large number of publications on PHDs and MAPs shows a growing interest in these models types. In the future new and more efficient methods for parameter fitting will be developed and become available in software tools. There are several developments which look very interesting but have not been included in this book, partially because the length of the text is limited and partially the approaches are not developed far enough. As examples we would like to mention the combination of PHDs and autoregressive processes [98], the parameter fitting for MMAPs and BMAPs [39, 65, 97] and the use of ME distributions [67, 111] and (M)RAPs [5, 38] rather than PHDs and (M)MAPs.