Preface

Mobile systems, whose components communicate and change their structure, now pervade the informational world and the wider world of which it is a part. But the science of mobile systems is yet immature. This science must be developed if we are properly to understand mobile systems, and if we are to design systems so that they do what they are intended to do. This book presents the π-calculus, a theory of mobile systems, and shows how to use it to express systems precisely and reason about their behaviour rigorously.

The book is intended to serve both as a reference for the theory and as an extended demonstration of how to use the π-calculus to express systems and analyse their properties. The book therefore presents the theory in detail, with emphasis on proof techniques. How to use the techniques is shown both in proofs of results that form part of the theory and in example applications of it.

The book is in seven Parts. Part I introduces the π-calculus and develops its basic theory. Part II presents variations of the basic theory and important subcalculi of the π-calculus. A distinctive feature of the calculus is its rich theory of types for mobile systems. Part III introduces this theory, and Part IV shows how it is useful for understanding and reasoning about systems. Part V examines the relationship between the π-calculus and higher-order process calculi. Part VI analyses the relationship between the π-calculus and the λ-calculus. Part VII shows how ideas from π-calculus can be useful in object-oriented design and programming.

The book is written at the graduate level and is intended for computer scientists interested in mobile systems. It assumes no prior acquaintance with the π-calculus: both the theory and the viewpoint that underlies it are explained from the beginning.

Although the book covers quite a lot of ground, several topics, notably logics for mobility, and denotational and non-interleaving semantics, are not treated at all. The book contains detailed accounts of a selection of topics, chosen for their interest and because they allow us to explore concepts and techniques that can also be used elsewhere. Each Part ends with some references to sources and additional notes on related topics. We have not attempted the arduous task of referring to all relevant published work. The references given provide starting points for a reader who wishes to go more deeply into particular topics. Sometimes, an element of arbitrariness in the choice of references was inevitable.

Many exercises are suggested to help appreciation of the material; the more difficult of them are marked with an asterisk. We intend to maintain a Web page for general information and auxiliary material about the book. At the time of writing, this page is located at

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http://www-sop.inria.fr/mimosa/personnel/Davide.Sangiorgi/
        Book_pi.html
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