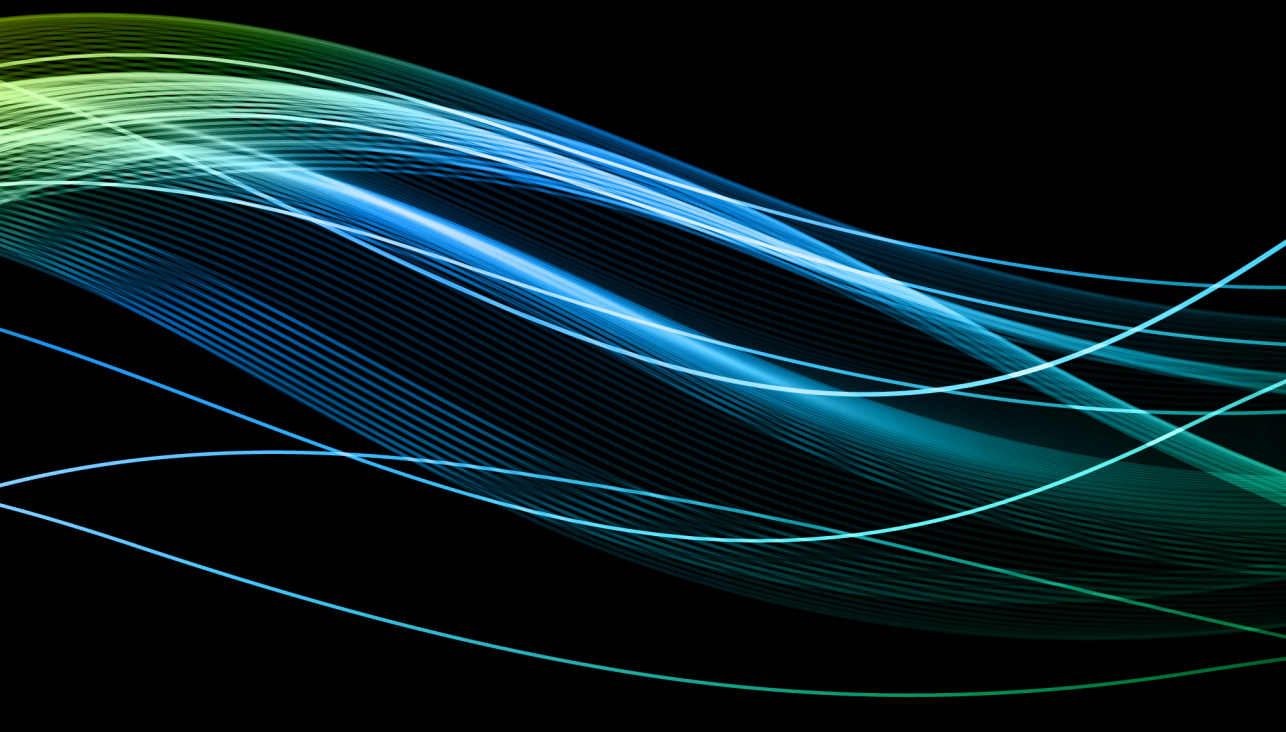
Stochastic methods for measurement-based network control

Ellens, W.

Stochastic Methods for Measurement-based Network Control

Wendy Ellens



Stochastic Methods

for

Measurement-based Network Control

Wendy Ellens
Korteweg-de Vries Instituut voor Wiskunde
Faculteit der Natuurwetenschappen, Wiskunde en Informatica
Universiteit van Amsterdam

Printing: GVO drukkers & vormgevers
Cover illustration: Abstract dark wave background, BSG Studio

Stochastic Methods
for
Measurement-based Network Control

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor
aan de Universiteit van Amsterdam
op gezag van de Rector Magnificus prof. dr. D. C. van den Boom
ten overstaan van een door het College voor Promoties ingestelde commissie,
in het openbaar te verdedigen in de Agnietenkapel
op donderdag 10 december 2015, te 14:00 uur

door

Wendy Ellens

geboren te Grijpskerk

Promotiecommissie

Promotores:	Prof. dr. M. R. H. Mandjes	Universiteit van Amsterdam
	Prof. dr. J. L. van den Berg	Universiteit Twente
Overige leden:	Prof. dr. G. M. Koole	Vrije Universiteit
	Dr. F. M. Spieksma	Universiteit Leiden
	Prof. dr. ir. R. E. Kooij	Technische Universiteit Delft
	Prof. dr. J. de Mast	Universiteit van Amsterdam
	Prof. dr. ir. C. T. A. M. de Laat	Universiteit van Amsterdam
	Prof. dr. R. Núñez-Queija	Universiteit van Amsterdam

Faculteit der Natuurwetenschappen, Wiskunde en Informatica

Acknowledgements

The work presented in this dissertation is the output of several fruitful collaborations while I was employed at consecutively the Dutch research institute TNO and the University of Amsterdam (UvA). More specifically, this dissertation is based on a series of papers that I have published together with peers from within and without these institutions.

- Chapter 2 is based on Section 4 of [1], which has been written in equal cooperation with Michel Mandjes (UvA) and Piotr Żuraniewski (TNO). Most of my efforts were focused on Sections 4.1, 4.2 and 4.5 of this publication.

- The major part of the contents of Chapter 3 and Chapter 4 have been taken from [2], which is a joint effort of Julia Kuhn (at that time a Master student at UvA and intern at TNO), Michel Mandjes and me. The work was based on earlier discussions between Michel and Piotr Żuraniewski. I have added the numerical results from [7], a paper written by Julia, under the supervision of Michel and me.

- The work described in Chapter 5 has been carried out within the Cyber Attack Detection (CAD) project, a project partially funded by the Dutch Ministry of Economic Affairs as part of the 'Maatschappelijke Innovatie Agenda Veiligheid' (IMV 1100032). The field experiment was performed by Anna Sperotto (University of Twente) and Harm Schotanus (TNO), the traffic flow analysis by Piotr Żuraniewski, Anna and me, guided by Erik Meeuwissen (TNO) and Michel Mandjes. I took the lead in writing the paper [3] that has led to this chapter.

- The results of Chapter 6 and Chapter 7 were earlier described in [6] and [4]. The former paper is an output of the TNO project CAMERA and reports results produced by Daniël Worm (TNO), Michel Mandjes and me, with the help of Hans van den Berg (TNO and University of Twente). The latter paper has extended the former by adding further theory and numerical results produced by Daniël, Michel, me and our Master student Sylwester Błaszczuk.

- Chapter 8 corresponds to [5], a paper with Peter Kovács (UvA), Sindo Núñez-Queija (UvA) and Hans van den Berg. Most of my effort has gone into Sections 2, 3 and 5 of this paper and the overall coordination, while Peter and Sindo took the lead in Section 4.

I wish to thank all the people I worked with in the past years — especially my supervisors ('promotores') Michel Mandjes and Hans van den Berg — as well as everyone who supported me during my time as a researcher at TNO and, after that, as a PhD candidate at UvA.

Wendy Ellens

Delft, 20 August 2015

Contents