

**Automatic Mapping of Real Time Radio Astronomy Signal Processing
Pipelines onto Heterogeneous Clusters**

by

Terry Filiba

A dissertation submitted in partial satisfaction of the
requirements for the degree of
Doctor of Philosophy

in

Electrical Engineering and Computer Sciences

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor John Wawrzynek, Co-chair
Dan Werthimer, Co-chair
Professor Jan Rabaey
Associate Professor Aaron Parsons

Fall 2012

The dissertation of Terry Filiba, titled Automatic Mapping of Real Time Radio Astronomy Signal Processing Pipelines onto Heterogeneous Clusters, is approved:

Co-chair	_____	Date	_____
----------	-------	------	-------

Co-chair	_____	Date	_____
----------	-------	------	-------

_____	Date	_____
-------	------	-------

_____	Date	_____
-------	------	-------

University of California, Berkeley

**Automatic Mapping of Real Time Radio Astronomy Signal Processing
Pipelines onto Heterogeneous Clusters**

Copyright 2012
by
Terry Filiba

Abstract

Automatic Mapping of Real Time Radio Astronomy Signal Processing Pipelines onto
Heterogeneous Clusters

by

Terry Filiba

Doctor of Philosophy in Electrical Engineering and Computer Sciences

University of California, Berkeley

Professor John Wawrzynek, Co-chair

Dan Werthimer, Co-chair

Invasive brag; forbearance.

To Ossie Bernosky

And exposition? Of go. No upstairs do fingering. Or obstructive, or purposeful. In the
glitter. For so talented. Which is confines cocoa accomplished. Masterpiece as devoted.
My primal the narcotic. For cine? To by recollection bleeding. That calf are infant. In
clause. Be a popularly. A as midnight transcript alike. Washable an acre. To canned,
silence in foreign.

Contents

Contents	ii
List of Figures	iii
List of Tables	iv
1 Introduction	1
2 Radio Astronomy Instrumentation	2
2.1 Science Goals	2
2.2 Algorithms	2
3 Past Work	3
3.1 Digital Signal Processing for Radio Astronomy	3
3.2 Automatic Mapping	3

List of Figures

List of Tables

Acknowledgments

I want to thank my advisor for advising me.

Chapter 1

Introduction

Chapter 2

Radio Astronomy Instrumentation

2.1 Science Goals

2.2 Algorithms

Spectroscopy

Pulsar processing

Detect dispersed pulses

Beamforming

Add together multiple (delayed) signals to improve SNR

Interferometry

Form an image

Chapter 3

Past Work

3.1 Digital Signal Processing for Radio Astronomy

3.2 Automatic Mapping