

CHAPTER 4

Organization of Dissertation

“Let all things be done decently and in order.”

— 1 Corinthians 14:40

The dissertation is organized as follows.

Part I describes the background of this work, including the technologies that underlie it and the previous research in this area. Part II presents our primary results, including the five program logics, the definition and proof of the VCG, and examples of its use. Part III is a tour of interesting aspects of the system; these are divided into those relevant to partial correctness and those supporting total correctness. Finally, Part IV presents our conclusions and possibilities for future research.

In Part I, Chapter 1 introduces and motivates the need for program correctness, and introduces the concept of verification condition generators. Chapter 2 describes the foundational technologies that underlie this work, such as structural operational semantics and Floyd/Hoare-style rules. Chapter 3 is a survey of previous research on verification condition generators, and in particular, methods to prove the total correctness of procedures. Chapter 4 gives the overall organization

of the dissertation.

In Part II, Chapter 5 defines the syntax and semantics of the Sunrise programming language and assertion language. Chapter 6 presents the five program logics, with their fourteen correctness specifications, that can be used to prove Sunrise programs totally correct. Chapter 7 is the heart of this work. It defines a verification condition generator for the Sunrise system, and also presents theorems that verify it. Chapter 8 then takes this VCG and applies it to several examples, with transcripts. Chapter 9 describes where the source code of the Sunrise system may be found, for readers who may wish to use the system themselves to prove programs.

In Part III, Chapter 10 describes various aspects of the system relating to proving partial correctness. Chapter 11 then describes the proof of termination, presenting its essence.

In Part IV, Chapter 12 describes our sense of this work's significance. Chapter 13 examines the question of ease of use for Sunrise. Chapter 14 gives an outline of our plans for future research in this area. Finally, Chapter 15 presents our conclusions.