SNU 4190.210 Principles of Programming
Part 0

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Objectives

- Learning:
  - Basics and Essence of programming
  - Concepts of program execution (or semantics)
- Balenced Viewpoint:
  - Programs can be seen as a tool for using computers.
  - Computers can be seen as a tool for executing programs.
- Broad Viewpoint:
  - Understanding today and future programming technology.

Objectives: After taking this course "Aha"

- I know how to design and write good programs.
- I know the current state of programming technology.
- I see how programming technology will evolve in the future.
- I am confident to write good programs in whatever language!

Contents

- Principles of Program Writing

간단한 부품의 반복구성	elements & compound
재귀와 반복	recursion & iteration
속내용 감추기	procedural & data abstraction
계층구조로 속내용 감추기	modularity & hierarchy
타입으로 정리+이해하기	types & typeful pgm'ng
맞는 프로그램인지 확인하기	program proof
물건중심의 프로그래밍	objects & imperative pgm'ng
값중심의 프로그래밍	value & applicative pgm'ng
예외상황 관리	exceptions & advanced control

- Concepts of Program Execution
  - 이름(name, variable), 환경(environment), 메모리(memory, state), 실행(evaluation, interpretation, semantics)

Key points

- This course is not for teaching particular programming languages.
- Focus on principles (Basics and Essence)
  - The programming languages we use in the course are just tools for conveying the principles.
- What you learn in this course will be applicable to whatever language you use in the future.

Programming languages we use: Scheme + ML

- Small & Simple
  - We can focus on learning principles.
  - We don't need to know complex grammars and features.
- Powerful & Practical
  - High-level programming language
  - Used in industry
- Good News: Unfamiliar language
  - Experience in C/Java is not an advantage
  - No experience in C/Java is not a disadvantage
  - Fair to everyone

Programming

- Describes how to do (or "compute") something
  - how to compute $\sqrt{2}$
  - how to make pizza
- Different from how to define something
  - $\sqrt{2}$ is the number whose square is 2.
  - Pizza is the cheapest Italian food.

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  - Growth rate of complexity of sw $>>$ that of hw
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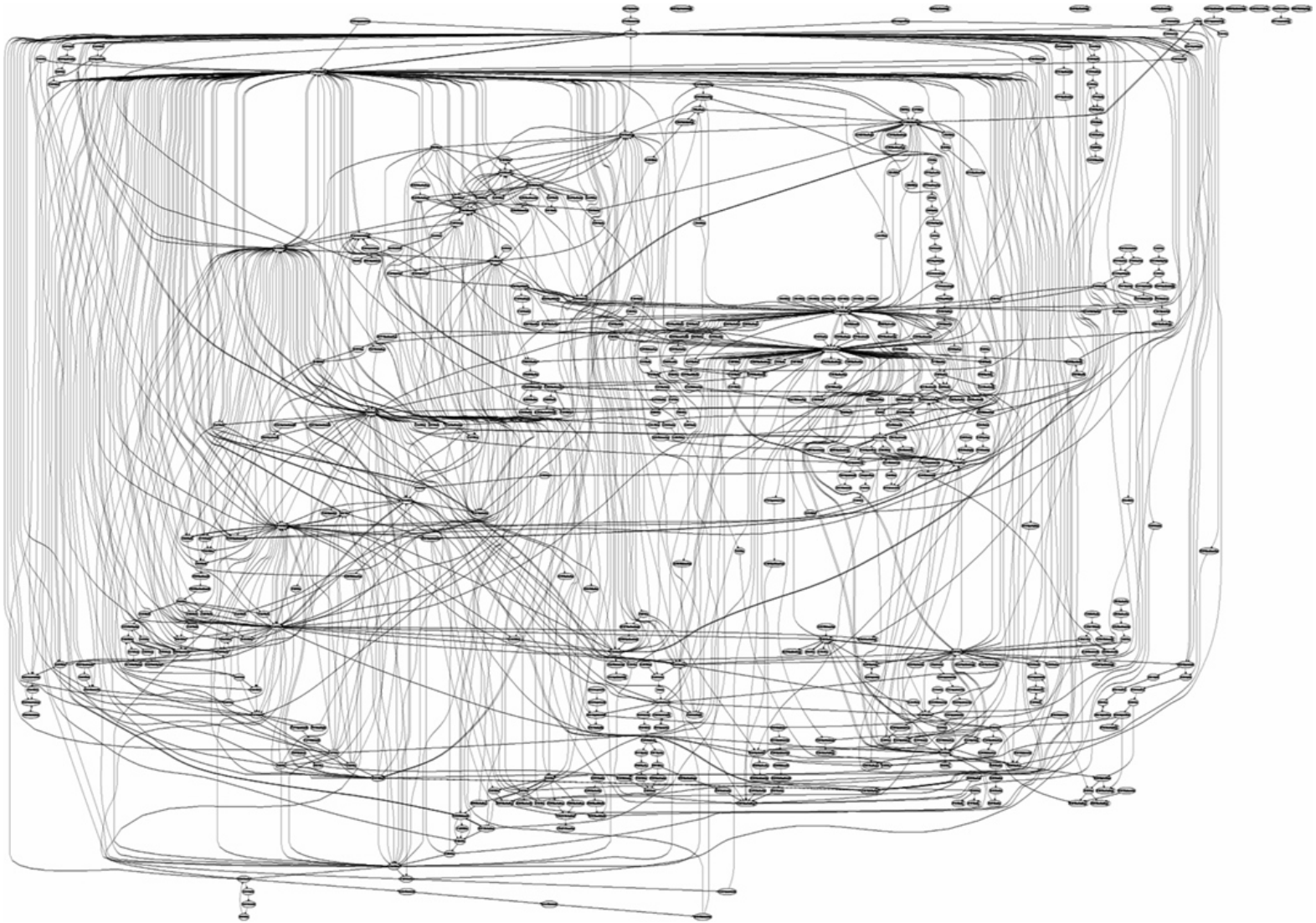
  - Must consider all possible situations & Must make no mistakes
- Hard to predict the behaviours of a program "before execution"
  - Impossible to predict automatically: Proved(1936, Alan Turing)
  - Try to predict manually: reduce the efforts using various tools
  - Current state of the technology: Immature

SW is complex



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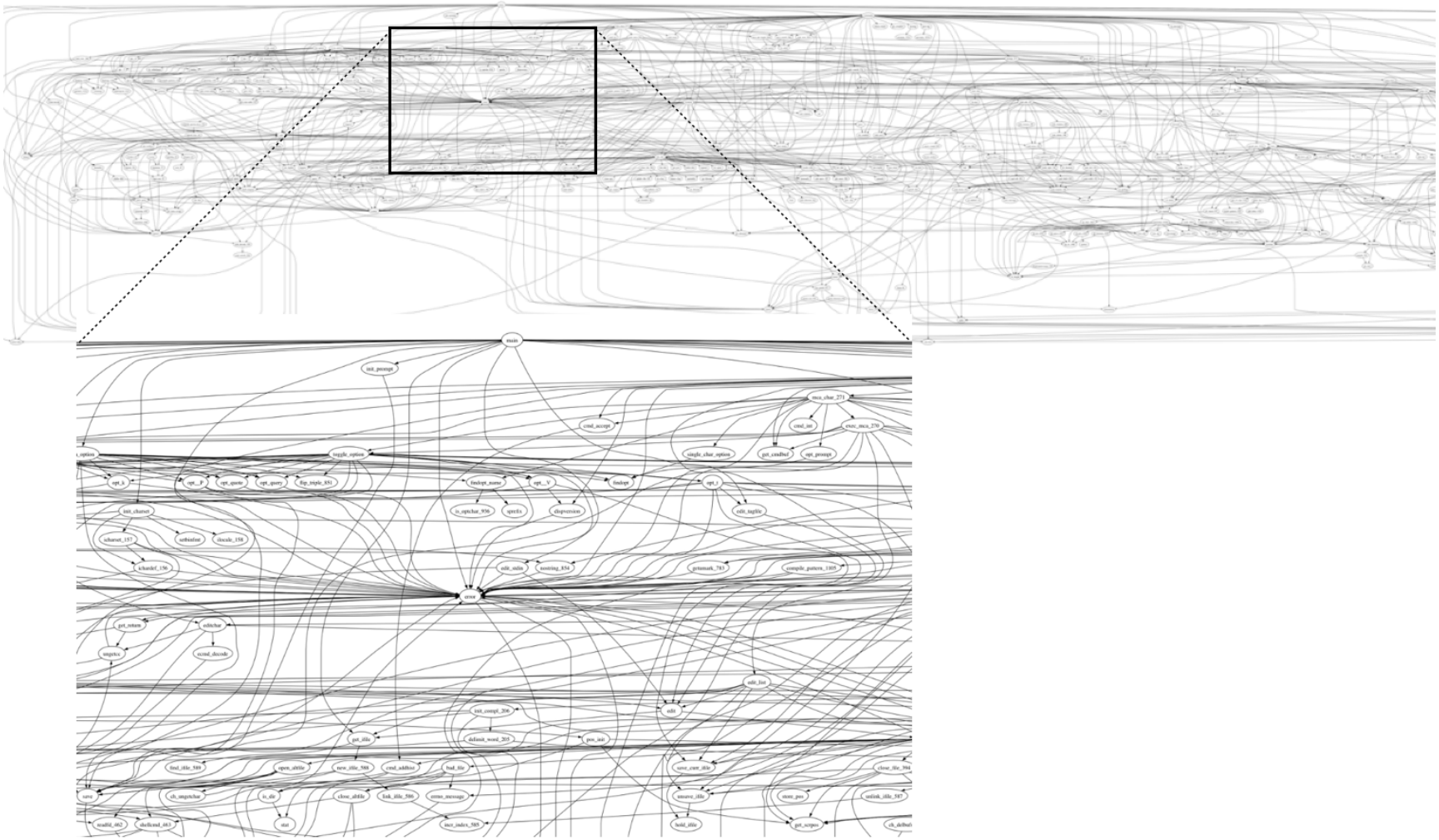

As complex as nature

A network consisting of 10,000 neurons in a mammal

Polytechnique Fédérale de Lausanne, *Blue Brain Project*, 2008