The Evolution of Extant Software

Eric Schulte

Department of Computer Science
University of New Mexico
Albuquerque, NM 87131-0001

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Outline

Main Points

Extant Software is

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1. Evolved

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2. Mutationally Robust

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3. Amenable to Genetic Programming (GP)

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Extant Software is

1. Evolved
2. Mutationally Robust
3. Amenable to Genetic Programming (GP)
   - automated diversity and proactive bug repair
   - automated bug repair
     - defects in off the shelf software
     - bug repair in embedded systems
     - security exploits in stripped binaries
   - automated optimization

Software is an Evolved System

- 50 years of development
- TODO: example; robust $\rightarrow$ flourish
- TODO: example; brittle $\rightarrow$ perish
- developer are agents of mutation, reproduction, selection
- copy paste coding

Outline

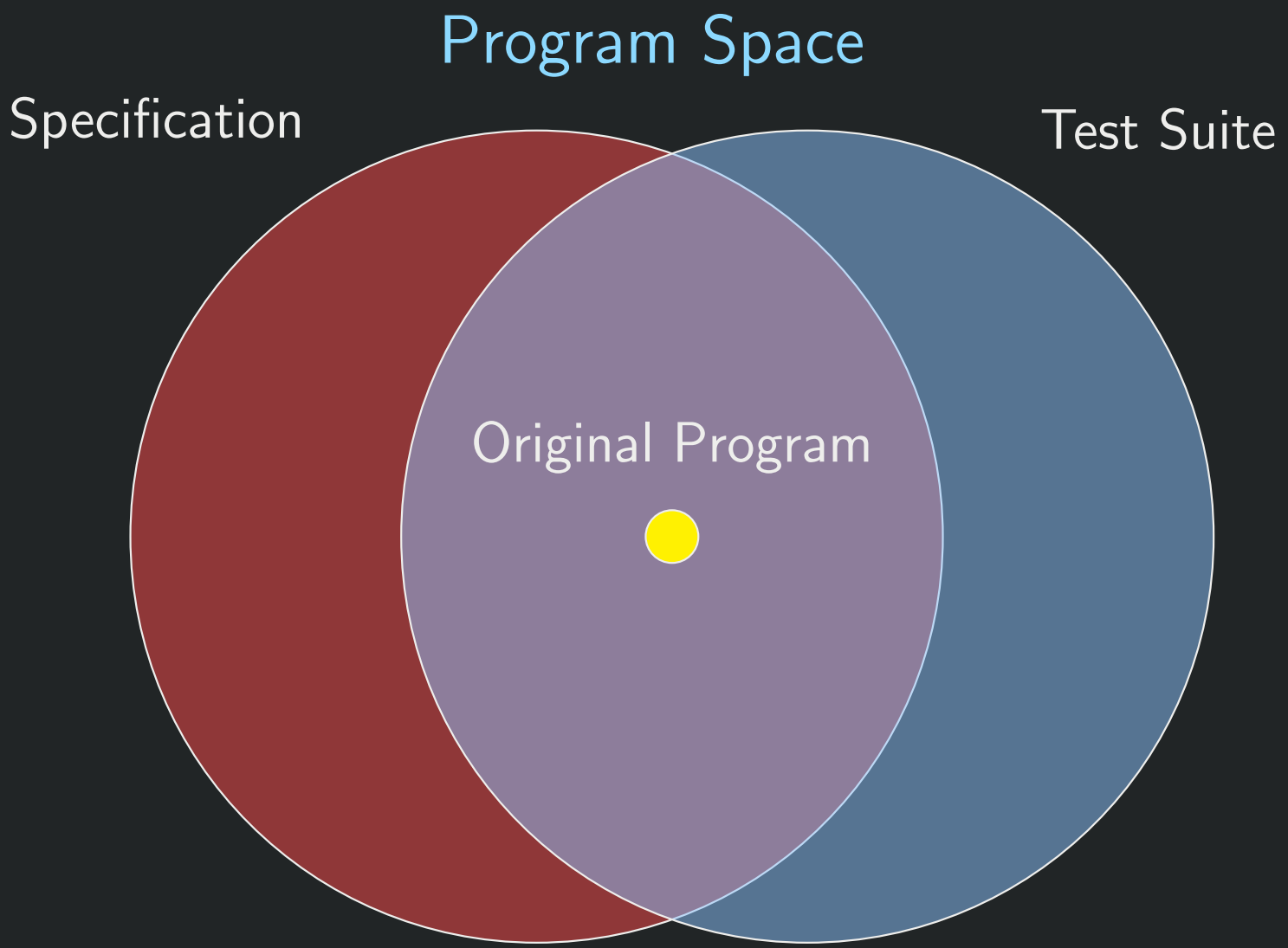
Software Mutational Robustness

Definition

P	program
T	test suite
M	mutation operators

$$MutRB(P, T, M) = \frac{|\{P' \mid m \in M.\ P' \leftarrow m(P) \ \wedge \ T(P')\}|}{|\{P' \mid m \in M.\ P' \leftarrow m(P)\}|}$$

Software Mutational Robustness



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Questions?

Eric Schulte

email eschulte@cs.unm.edu

homepage https://cs.unm.edu/~eschulte

BACKUP SLIDES

Reproducible Research

Physical Evolutionary Computation