

Test-Input Generation using Computational Real Algebraic Geometry

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One of the fundamental challenges in software testing is automatic test-input generation. Due to its importance, intensive research have been carried out among computer scientists, resulting in various methods such as structural testing, model-based testing, combinatorial testing, random testing, search-based testing, etc.

In this talk, we will present another method intended for numerical software. The method is based on various ideas and theories from computational real algebraic geometry and topology such as critical points, gradient tracking, Morse-Smale complex, etc. It can in principle generate one and only one test-input for each and every possible execution path. Various heuristics are being developed in order to increase the practical efficiency.

We hope that the method will grow mature through collaboration between the program verification community and the computational real algebraic geometry community.