Programming Semantics to Topological Systems

Computational topology is a current and appropriate label for the integration of computer science and topology and comprises several subdisciplines. One of the newly emerging subdisciplines comprises the nexus of programming, topological systems, and fuzzy (many-valued) topology primarily spurred by S. J. Vickers work (1989) on the logic of finite observations and topological systems, followed by J. T. Denniston’s and S. E. Rodabaugh’s work (2009) showing that topological systems are part of fuzzy topology. This talk specifically examines the path from programming semantics to topological systems, beginning with E. W. Dijkstra’s seminal ideas (1976) on improving the quality of programming, adding in the notion that predicates have a structure consistent with finite observational logic—leading to the view of M. Smyth (1983) that predicates be a topology (of open sets), applying a simple restriction technique of Denniston / A. Melton / Rodabaugh (2014), and finally motivating Vickers’ axioms (1989) for systems and morphisms (or “continuous programs”) between them. Such systems will be briefly compared to Chu systems/games (1979). All of the foregoing is in the context of deterministic programs—the nondeterministic case needs a separate treatment.