Discrete and classical vector field dynamics

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The Forman's discrete Morse theory is an analogy of the classical Morse theory with, so far, only informal ties. Our goal is to establish a formal tie on the level of induced dynamics. Following the Forman's 1998 paper on "Combinatorial vector fields and dynamical systems", we start with a possibly non-gradient combinatorial vector field. We construct a flow-like upper semi-continuous acyclic-valued mapping whose dynamics is equivalent to the dynamics of the Forman's discrete vector field, in the sense that isolated invariant sets and index pairs are in one-to-one correspondence. The passage to an equivalent continuous single-valued vector field is completed using the graph approximation. This is a joint work with M. Mrozek and Th. Wanner. In my talk, I focus on the construction and properties of the linking multivalued mapping and refer to the Mrozek's talk at the B2 workshop for the extension of the Conley index theory in the combinatorial setting.

Joint work with Marian Mrozek (Jagiellonian University, Krakow, Poland), and Thomas Wanner (George Mason University, Fairfax, USA).