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Extracting Dynamical Information from a Morse-Novikov Spectral Sequence

The goal of this talk is to obtain dynamical information from algebraic-topological tools found in Conley Theory and used to explore filtered chain complexes and their underlying spectral sequences.

One can describe the qualitative aspects of a Morse-Novikov flow in terms of a chain complex generated by the critical points of a circle-valued Morse function and whose differential counts flow lines (with signs) between them. Endowing this chain complex with an increasing filtration, one can associate to it a spectral sequence (E^r, d^r). We develop an algorithm, Smale's Cancellation Sweeping Algorithm (SCSA), which models the spectral sequence and generates a collection of connection matrices from which one can recover the differentials d^r. Whenever the SCSA identifies a non null differential on the r-th page of (E^r, d^r), one observes algebraic cancellations occurring within the modules E^{r+1}'s.

These algebraic cancellations are dynamically interpreted as cancellations of consecutive critical points. During this process, we keep track of all dynamical information on the birth and death of connecting orbits between critical points, as well as periodic orbits that may arise within a family of circle-valued Morse functions. Furthermore, this family corresponds to a continuation from the initial Morse-Novikov flow to a minimal Morse-Novikov flow.

References

[1] M.A. Bertolim, D.V.S. Lima, M.P. Mello and K.A. de Rezende, M.R. Silveira. *An Algorithmic Approach to Algebraic and Dynamical Cancellations associated to a Spectral Sequence.* To appear.

[2] D.V.S. Lima, K.A. de Rezende, M.R. Silveira, O. Manzoli. *Cancellations for Circle-valued Morse Functions via Spectral Sequences.* Submitted. ArXiv:1610.08579.