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CANCELLATIONS FOR CIRCLE-VALUED MORSE FUNCTIONS VIA SPECTRAL SEQUENCES

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Abstract. A spectral sequence analysis of a filtered Novikov complex $(\mathcal{N}_*(f), \Delta)$ over $\mathbb{Z}((t))$ is developed with the goal of obtaining results relating the algebraic and dynamical settings. Specifically, the unfolding of a spectral sequence of $(\mathcal{N}_*(f), \Delta)$ and the cancellation of its modules is associated to a one parameter family of circle-valued Morse functions on a surface and the dynamical cancellations of its critical points. The data of a spectral sequence computed for $(\mathcal{N}_*(f), \Delta)$ is encoded in a family of matrices Δ^r produced by the Spectral Sequence Sweeping Algorithm (SSSA), which has as its initial input the differential Δ. As one "turns the pages" of the spectral sequence, differentials which are isomorphisms produce cancellation of pairs of modules. Corresponding to these cancellations, a family of circle-valued Morse functions f^r is obtained by successively removing the corresponding pairs of critical points of f. We also keep track of all dynamical information on the birth and death of connecting orbits between consecutive critical points, as well as periodic orbits that arise within a family of negative gradient flows associated to f^r.

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