Knebusch

Weakly Semialgebraic Spaces

The book is the second part of an intended three-volume treatise on semialgebraic topology over an arbitrary real closed field R. In the first volume (LNM 1173) the category LSA(R) or regular paracompact locally semialgebraic spaces over R was studied. The category WSA(R) of weakly semialgebraic spaces over R - the focus of this new volume - contains LSA(R) as a full subcategory. The book provides ample evidence that WSA(R) is "the" right cadre to understand homotopy and homology of semialgebraic sets, while LSA(R) seems to be more natural and beautiful from a geometric angle. The semialgebraic sets appear in LSA(R) and WSA(R) as the full subcategory SA(R) of affine semialgebraic spaces. The theory is new although it borrows from algebraic topology. A highlight is the proof that every generalized topological (co)homology theory has a counterpart in WSA(R) with in some sense "the same", or even better, properties as the topological theory. Thus we may speak of ordinary (=singular) homology groups, orthogonal, unitary or symplectic K-groups, and various sorts of cobordism groups of a semialgebraic set over R. If R is not archimedean then it seems difficult to develop a satisfactory theory of these groups within the category of semialgebraic sets over R: with weakly semialgebraic spaces this becomes easy. It remains for us to interpret the elements of these groups in geometric terms: this is done here for ordinary (co)homology.

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