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A COINCIDENCE-FIXED-POINT INDEX ¹

by Albrecht DOLD

B. Eckmann anlässlich seines 60. Geburtstages gewidmet

INTRODUCTION

The fixed point set of a map $\varphi: X \rightarrow X$ is, generically, a discrete set; if it is compact its (weighted) cardinality is measured by the Hopf-index $I(\varphi) \in \mathbf{Z}$. The coincidence set K of a pair of maps $(\varphi, p): X \rightrightarrows Y$ is not discrete; its generic dimension is $\dim K = \dim X - \dim Y$. If K is compact it can sometimes (compare 3.8) be measured by a cohomology invariant κ , but even then κ is difficult to deal with. This might explain why most studies on coincidence questions make additional assumptions on (φ, p) , or use auxiliary data. For instance, if one of the maps, say p , admits a section of sorts σ then the fixed points of $\sigma\varphi$ are in K so that fixed point methods give coincidence results. Usually σ is not a genuine section; for instance, if p is a Vietoris map then one uses $(p^*)^{-1}$, on the cohomology level (cf. 3.7).

The idea of the present lecture is to let fixed point transfers in the sense of [2] play the role of σ ; we have to assume, therefore, that p is ENR_Y which means (roughly speaking; cf. [2]) that p has sufficiently many local sections. Actually, our procedure for counting fixed points of $\sigma\varphi$ (cf. §1) is much more elementary than [2] and doesn't really use transfers. Only when we express the number of fixed points of $\sigma\varphi$ as a Lefschetz trace in theorem 2.1, transfers t become essential. If one imposes further (rather restrictive) assumptions on p then t can be eliminated again (from the theorem; it is still used in the proof), as shown in prop. 3.5. — The last section of the paper discusses applications (3.1-3.6) and problems (3.7, 3.8).

¹) Presented at the Colloquium on Topology and Algebra, April 1977, Zurich.