Fillmore, Jay P.

On Lie’s higher sphere geometry.


The article consists of five sections: (1) Introduction, (2) Homogeneous contact manifolds, (3) Codirections in projective space, (4) Higher sphere geometry, (5) The line-sphere transformations. The main aim of this article is to develop a modern approach to the classical higher sphere geometry by S. Lie in the same spirit as W. M. Boothby has done in his description of homogeneous contact manifolds [cf. Proceedings of the Symposium on Pure Mathematics, Vol. III, pp. 144–154, Amer. Math. Soc., Providence, R.I., 1961; MR0124863]. The main tool is the detailed study of the structure of classical simple Lie groups. As a special result of the last section, the author shows that (a) the complex line geometry and the complex sphere geometry are isomorphic, (b) the real line geometry and the real sphere geometry are two distinct real forms of the same complex geometry.

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