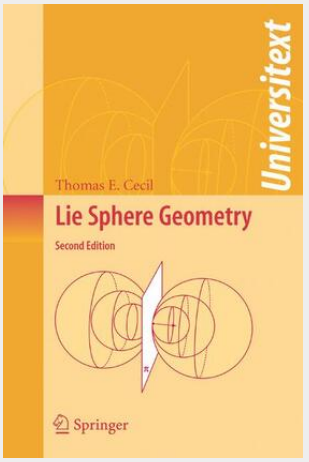
Cecil

Lie Sphere Geometry

With Applications to Submanifolds

Thomas Cecil is a math professor with an unrivalled grasp of Lie Sphere Geometry. Here, he provides a clear and comprehensive modern treatment of the subject, as well as its applications to the study of Euclidean submanifolds. It begins with the construction of the space of spheres, including the fundamental notions of oriented contact, parabolic pencils of spheres, and Lie sphere transformations. This new edition contains revised sections on taut submanifolds, compact proper Dupin submanifolds, reducible Dupin submanifolds, and the cyclides of Dupin. Completely new material on isoparametric hypersurfaces in spheres and Dupin hypersurfaces with three and four principal curvatures is also included. The author surveys the known results in these fields and indicates directions for further research and wider application of the methods of Lie sphere geometry.

The purpose of this monograph is to provide an introduction to Lie's geometry of oriented spheres and its recent applications to the study of submanifolds of Euclidean space. Lie [104] introduced his sphere geometry in his dissertation, published as a paper in 1872, and used it in his study of contact transformations. The subject was actively pursued through the early part of the twentieth century, culminating with the publication in 1929 of the third volume of Blaschke's [10] Vorlesungen über Differentialgeometrie, which is devoted entirely to Lie sphere geometry and its subgeometries. After this, the subject fell out of favor until 1981, when Pinkall 4 [146] used it as the principal tool in his classi? cation of Dupin hypersurfaces in R. Since that time, it has been employed by several geometers in the study of Dupin, isoparametric and taut submanifolds. This book is not intended to replace Blaschke's work, which contains a wealth of material, particularly in dimensions two and three. Rather, it is meant to be a relatively brief introduction to the subject, which leads the reader to the frontiers of currentresearchinthispartofsubmanifoldtheory. Chapters2and3(chapternumbers fromthesecondedition)areaccessibletoabeginninggraduatestudentwhohastaken courses in linear and abstract algebra and projective geometry. Chapters 4 and 5 containtheapplicationstosubmanifoldtheory. Thesechaptersrequirea?rstgraduate course in differential geometry as a necessary background. Adetailed description of the contents of the individual chapters is given in the introduction, which also serves as a survey of the ?eld to this point in time.



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