Combinatorial geometry of flag domains in G/B

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Abstract

A real form G_0 of a complex semisimple Lie group G has only finitely many orbits in any given compact G-homogeneous projective algebraic manifold $Z = G/Q$. A maximal compact subgroup K_0 of G_0 has special orbits C which are complex sub-manifolds in the open orbits of G_0. These are referred to as *cycles*. The cycles intersect Shubert varieties S transversely in finitely many points. In particular, determining these points of intersection yields a description of the topological class of the given cycle. This was carried out for all real forms of $SL(n, \mathbb{C})$ in the work of A. Brecan. Our work here is devoted to the real forms of the other classical groups, $Sp(2n, \mathbb{C})$ and $SO(n, \mathbb{C})$. For the manifold $Z = G/B$ of complete flags the points of intersection in $S \cap C$ are described, in particular the number of such is computed. For certain real forms, e.g., $Sp(2n, \mathbb{R})$ and $SO^*(2n)$, remarkably simple formulas are proved. In other cases the results are algorithmic in nature.