Zak, F. L.

Structure of Gauss maps. (English. Russian original) Zbl 0623.14026

Funct. Anal. Appl. 21, No. 1-3, 32-41 (1987); translation from Funkts. Anal. Prilozh. 21, No. 1, 39-50 (1987).

The classical Gauss map $\gamma : X^n \to G(N,n)$ associates to a point x of a nonsingular projective algebraic variety $X^n \subset \mathbb{P}^N$ the point in the Grassmann variety G(N,n) of n-dimensional linear subspaces in $\mathbb{P}^N$ corresponding to the embedded tangent space $T_{X,x}$ to X at x. Thus the fiber of γ over a point $L \in G(N,n)$ is the set of points (with multiplicities) at which the embedded tangent space to X coincides with L. Similarly, for each $n \leq m \leq N-1$ we consider the higher Gauss map γ_m whose fiber over a point $L \in G(N,m)$ coincides with the set of points $x \in X$ such that $T_{X,x} \subset L^m$ (i.e. L is tangent to X at x). We study the structure of the maps γ_m with special reference to the cases $m = n$ and $m = N-1$ and consider applications to tangencies, projections, varieties of small codimension etc.

MSC:

14N05 Projective techniques in algebraic geometry
14M15 Grassmannians, Schubert varieties, flag manifolds

Keywords:

dual variety; Gauss map; Grassmann variety; tangencies; projections; varieties of small codimension

Full Text: DOI

References:

[1] L. Ein, "The ramification divisors for branched coverings of P k n ," Math. Ann.,261, 483-485 (1982). · Zbl 0519.14005 · doi:10.1007/BF01457451

[2] W. Fulton and R. Lazarsfeld, "Connectivity and its applications in algebraic geometry," Lect. Notes Math.,862, 26-92 (1981). · Zbl 0484.14005 · doi:10.1007/BFb0090889

[3] P. Griffiths and J. Harris, "Algebraic geometry and local differential geometry," Ann. Sci. Ec. Norm. Sup.,12, 355-432 (1979). · Zbl 0426.14019

[4] A. Grothendieck, Elements de Geometrie Algebrique, Chap. II, Publ. Math. IHES, No. 8, Chap. IV2 (1961); Elements de Geometrie Algebrique, Chap. II, Publ. Math. IHES, No. 24 (1965).

[5] H. Hironaka and H. Matsumura, "Formal functions and formal embeddings," J. Math. Soc. Jpn.,20, 52-82 (1968). · Zbl 0157.27701 · doi:10.2969/jmsj/02010052

[6] K. Johnson, "Immersion and embedding of projective varieties," Acta Math.,140, 49-74 (1978). · Zbl 0373.14005 · doi:10.1007/BF02392303

[7] S. L. Kleiman, "Numerical theory of singularities," Usp. Mat. Nauk,35, No. 6, 69-148 (1980). · Zbl 0451.14020

[8] S. L. Kleiman, "Concerning the dual variety," in: Proc. 18th Scand. Congress Math. Aarhus, Birkhäuser Verlag, Basel?Boston?Stuttgart (1981), pp. 386-396. · Zbl 0468.14018

[9] M. E. Larsen, "On the topology of complex projective manifolds," Invent. Math.,19, 251-260 (1972). · Zbl 0255.32004 · doi:10.1007/BF01390209

[10] Z. Ran, "The structure of Gausslike maps," Compos. Math.,52, 171-177 (1984). · Zbl 0547.14004

[11] F. L. Zak, "Surfaces with null Lefschetz cycles," Mat. Zametki,13, 869-880 (1973). · Zbl 0275.14019

[12] F. L. Zak, "Projections of algebraic varieties," Mat. Sb.,116, 593-602 (1981). · Zbl 0484.14016