

Classification Of Cylindrically Symmetric Static Spacetimes

According

To Their Ricci Collineations

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Summary

A complete classification of cylindrically symmetric static Lorentzian manifolds according to their Ricci collineations (RCs) is provided. The Lie algebras of RCs for the non-degenerate Ricci tensor have dimensions 3 to 10, excluding 8 and 9. For the degenerate tensor the algebra is mostly but not always infinite dimensional; there are cases of 10-, 5-, 4- and 3-dimensional algebras. The RCs are compared with the Killing vectors (KVs) and homothetic motions (HMs). The (non-linear) constraints corresponding to the Lie algebras are solved to construct examples which include some exact solutions admitting proper RCs. Their physical interpretation is given. The classification of plane symmetric static spacetimes emerges as a special case of this classification when the cylinder is unfolded.

References:

1. AMIR MJ, 1994, J MATH PHYS, V35, P3005
2. BOKHARI AH, 1987, J MATH PHYS, V28, P1019
3. BOKHARI AH, 1988, J MATH PHYS, V29, P525
4. BOKHARI AH, 1993, J MATH PHYS, V34, P3543
5. CAROT J, 1999, CLASSICAL QUANT GRAV, V16, P3025
6. CHRISTENSEN M, 1999, PHYS REV D, V60, ARTN 125012
7. COLDING J, 1997, PHYS REV D, V56, P3371
8. DAVIES H, 1971, P CAMB PHILOS SOC, V69, P325
9. DAVIS WR, 1962, AM J PHYS, V30, P750
10. DAVIS WR, 1976, NUOVO CIMENTO B, V24, P256
11. DIAS OJC, 2002, CLASSICAL QUANT GRAV, V19, P2265

12. EINSTEIN A, 1937, J FRANKL INST, V223, P43
13. EVANS AB, 1977, J PHYS A, V10, P1303
14. FARID TB, 1995, J MATH PHYS, V36, P5812
15. FEROZE T, 2001, J MATH PHYS, V42, P4947
16. HAYWARD SA, 2000, CLASSICAL QUANT GRAV, V17, P1749
17. HERRERA L, 2001, GEN RELAT GRAVIT, V33, P515
18. HINDMARSH MB, 1995, REP PROG PHYS, V58, P477
19. KATZIN GH, 1969, J MATH PHYS, V10, P617
20. KATZIN GH, 1970, J MATH PHYS, V11, P1518
21. KRAMER D, 1980, EXACT SOLUTIONS EINS
22. KRAMER D, 2002, CLASSICAL QUANT GRAV, V19, P2257
23. KRASINSKI A, 1978, REP MATH PHYS, V14, P225
24. LEMOS JPS, 1998, PHYS REV D, V57, P4600
25. LEVICIVITA T, 1917, REND ACC LINCEI, V26, P307
26. LEVICIVITA T, 1918, REND ACC LINCEI, V27, P220
27. LEVICIVITA T, 1918, REND ACC LINCEI, V27, P240
28. LEVICIVITA T, 1918, REND ACC LINCEI, V27, P283
29. LEVICIVITA T, 1918, REND ACC LINCEI, V27, P3
30. LEVICIVITA T, 1918, REND ACC LINCEI, V27, P343
31. LEVICIVITA T, 1919, RC ACCAD LINCEI, V28, P101
32. LEVICIVITA T, 1919, REND ACC LINCEI, V28, P3
33. LEWIS T, 1932, P R SOC LOND A-CONTA, V136, P176
34. LIANG CB, 1995, GEN RELAT GRAVIT, V27, P669
35. PAPAPETROU A, 1966, ANN I H POINCARÉ A, V4, P83
36. PETROV AZ, 1969, EINSTEIN SPACES
37. PHILBIN TG, 1996, CLASSICAL QUANT GRAV, V13, P1217
38. QADIR A, 1988, J MATH PHYS, V29, P2473
39. QADIR A, 1990, J MATH PHYS, V31, P254
40. QADIR A, 1993, P 6 M GROSSM M, P1115
41. QADIR A, 1995, NUOVO CIMENTO B, V110, P277
42. QADIR A, 1995, NUOVO CIMENTO B, V110, P317
43. QADIR A, 1998, NUOVO CIMENTO B, V113, P773
44. QADIR A, 2000, CLASSICAL QUANT GRAV, V17, P345
45. SAFKO JL, 1971, J MATH PHYS, V12, P257
46. SAFKO JL, 1977, PHYS REV D, V16, P1678
47. SAIFULLAH K, 2003, THESIS QUAID I AZAM
48. SENOVILLA JMM, 2000, CLASSICAL QUANT GRAV, V17, P2843
49. TURKOWSKI P, 1988, J MATH PHYS, V29, P2139
50. WEYL H, 1917, ANN PHYS-BERLIN, V54, P117
51. XANTHOPOULOS BC, 1986, PHYS REV D, V34, P3608
52. ZIAD M, 1990, THESIS QUAID I AZAM

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