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Actions of Lie groups and Lie algebras on manifolds.

T_m denotes the identity component of the group of $m \times m$ real upper triangular matrices, $ST_m \subset T_m$ the subgroup of unimodular matrices. M^n denotes any n-manifold of Euler characteristic χ. Results to be discussed include the following:

- T_n acts effectively on M^n.
- T_{n+1} does not have an effective C^ω (= real analytic) action on M^n.
- ST_n acts C^∞ effectively on M^n.
- ST_3 acts C^ω effectively on every compact M^2, with finite fixed point set.
- The 4-dimensional solvable real Lie algebra with structure $[X, U] = -V$, $[X, V] = U$, $[U, V] = Z$, Z central, has no effective C^1 action on any M^2. The real form of its complexification has no effective C^1 action on any M^3.

Now assume M^2 is compact.

- Let a Lie group G act C^ω effectively on M^2 with ν fixed points. If $\chi < 0$ then $\nu > 0$. If some element of $ad(G)$ has nonreal spectrum then $\nu \leq \chi$.
- If M^2 is closed, the universal covering of $SL(2, R)$ acts effectively on M^2 with a unique fixed point. (Received September 28, 2005)