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Equivariant differential characters and Chern-Simons bundles. (English) Zbl 07394077  
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Summary: We construct Chern-Simons bundles as $\text{Aut}^+ P$-equivariant $U(1)$-bundles with connection over the space of connections $A_P$ on a principal $G$-bundle $P \to M$. We show that the Chern-Simons bundles are determined up to isomorphisms by their equivariant holonomy. The space of equivariant holonomies is shown to coincide with the space of equivariant differential characters of order 2. Furthermore, we prove that the Chern-Simons theory provides, in a natural way, an equivariant differential character that determines the Chern-Simons bundles. Our construction can be applied in the case in which $M$ is a compact manifold of even dimension and for arbitrary bundle $P$ and group $G$.

We also generalize the results to the case of the action of diffeomorphisms on the space of Riemannian metrics. In particular, in dimension 2 we obtain a Chern-Simons bundle over the Teichmüller space.

MSC:
- 55N91 Equivariant homology and cohomology in algebraic topology
- 70S15 Yang-Mills and other gauge theories in mechanics of particles and systems
- 53C08 Differential geometric aspects of gerbes and differential characters
- 53C29 Issues of holonomy in differential geometry
- 58J28 Eta-invariants, Chern-Simons invariants

Keywords:  
equivariant differential character; equivariant holonomy; Chern-Simons bundle; space of connections; space of Riemannian metrics

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