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Homeomorphism groups of non-compact surfaces and graphs

It is shown that for any connected non-compact surface X the connected component $H_0(X)$ of the homeomorphism group $H(X)$ of X, endowed with the Whitney (or graph) topology, is homeomorphic to $\mathbb{R}^\infty \times \ell_2$.

Also for any non-compact connected 1-dimensional CW-complex X of density κ the homeomorphism group $H(X)$ with the Whitney topology is homeomorphic to the κ-th power $(\ell_2)^\kappa$ of the separable Hilbert space ℓ_2 endowed with the box-topology, while $H_0(X)$ is homeomorphic to the subspace $(\ell_2)_0^\kappa$ of $(\ell_2)^\kappa$ consisting of sequences $(x_\alpha)_{\alpha\kappa}$ with finite support $\{\alpha : x_\alpha \neq 0\}$.

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