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Approximating topologies using finite posets and order preserving maps.

The usefulness of topology in science and mathematics means that topological spaces must be studied, and computers should be used in this study. We discuss classical and recent results showing how many useful spaces (including all compact Hausdorff spaces) are approximated by a system of finite T0-spaces and continuous maps. Finite spaces are completely determined by their specialization orders and the continuous maps between them are those which are order preserving.

T0-spaces are those for which the specialization is a partial order, so the above approximation is by finite posets and order preserving maps. We discuss the relationship between properties of the maps between the finite spaces, and the properties of the approximated space. We also show how an inverse sequence of polytopes and simplicial maps can be replaced by such a system of finite posets and order preserving maps, to obtain the limit of the original system without roundoff or storage issues. (Received July 11, 2006)