

- OWEN MILNER, *Formalizing the Whitehead tower in cubical agda*.
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This talk will present details of a formalization, in cubical agda, of the key properties of the Whitehead tower. This construction has been an important tool for computing the algebraic invariants of spaces since the work of Cartan and Serre [1] and Whitehead [2] in the early 1950s. The recent development of homotopy type theory (as in [3], and [4]) has made it possible for significant parts of classical algebraic topology to be developed synthetically and constructively, and in a manner suitable for computer formalization. Work such as that being presented here connects a canonical part of pure mathematics with the burgeoning interest in formalization and verification of mathematics by computers. The formalization includes not only the definition of the Whitehead tower, but also a proof of that its objects satisfy a universal property, the computation of their homotopy groups, and the identification of the fibers of the structure maps of the tower as particular Eilenberg-MacLane spaces. Parts of the formalization are available online [5].

[1] CARTAN, HENRI AND SERRE, JEAN-PIERRE, *Espaces Fibrés et Groupes d'Homotopie, I, Comptes Rendus Hebdomadaires de Séances de l'Académie des Sciences* Académie de Sciences (France), Quai des Grands-Augustins, 55, Paris, France, 1952, pp. 288–290.

[2] WHITEHEAD, GEORGE W., *Fiber Spaces and the Eilenberg Homology Groups, Proceedings of the National Academy of Sciences 38(5)* (Linus Pauling, Edwin B. Wilson et al., editors), National Academy of Sciences of the United States of America, 2101 Constitution Avenue, Washington 25, D. C., USA, 1952, pp. 426–430.

[3] THE UNIVALENT FOUNDATIONS PROGRAM, *Homotopy Type Theory: The Univalent Foundations of Mathematics*, <https://homotopytypetheory.org/book/>, The Institute for Advanced Study, 2013.

[4] COHEN, CYRIL AND COQUAND, THIERRY AND HUBER, SIMON AND MÖRTBERG, ANDERS, *Cubical Type Theory: A Constructive Interpretation of the Univalence Axiom, Post-Proceedings of the 21st International Conference on Types for Proofs and Programs (TYPES 2015)* (Tallinn, Estonia), (Tarmo Uustalu, editor), Dagstuhl Publishing, 2018, pp. 129–162.

[5] MILNER, OWEN AND BARTON, REID AND LJUNGSTRÖM, AXEL ET AL. *Code Repository*, <https://github.com/CMU-HoTT/serre-finiteness>