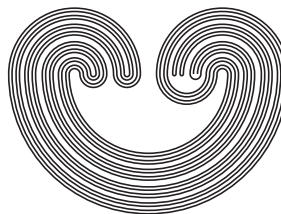


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TOPOLOGY PROCEEDINGS



Volume 62, 2023

Pages 45–63

PRISM COMPLEXES

by

TEJAS KALELKAR AND RAMYA NAIR

Electronically published on November 25, 2022

This file contains only the first page of the paper. The full version of the paper is available to Topology Proceedings subscribers.

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E-mail: topolog@auburn.edu

ISSN: (Online) 2331-1290, (Print) 0146-4124

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PRISM COMPLEXES

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ABSTRACT. A prism is the product space $\Delta \times I$ where Δ is a 2-simplex and I is a closed interval. We introduce prism complexes as an analogue of simplicial complexes and show that every compact 3-manifold has a prism complex structure. We call a prism complex *special* if each interior horizontal edge lies in four prisms, each boundary horizontal edge lies in two prisms, and no horizontal face lies on the boundary. We give a criterion for existence of horizontal surfaces in (possibly non-orientable) Seifert fiber spaces. Using this, we show that a compact 3-manifold admits a special prism complex structure if and only if it is a Seifert fiber space with non-empty boundary, a Seifert fiber space with a non-empty collection of surfaces in its exceptional set, or a closed Seifert fiber space with Euler number zero. So, in particular, a compact 3-manifold with boundary is a Seifert fiber space if and only if it has a special prism complex structure.

1. INTRODUCTION

A closed 3-manifold M is called *irreducible* if every embedded 2-sphere in M bounds a 3-ball. If M is reducible, then there exist finitely many disjointly embedded 2-spheres in M such that after cutting M along these spheres and capping off the spherical boundaries with 3-balls, the closed manifolds obtained are either irreducible or $S^2 \times S^1$. These capped off pieces can be further decomposed along a canonical collection of disjointly embedded tori into compact manifolds which have three possibilities: They are either finitely covered by torus bundles, or they are Seifert fiber

2020 *Mathematics Subject Classification.* Primary 57Q25, 57M99.

Key words and phrases. cube complexes, Seifert fiber space.

The first author was supported by the MATRICS grant of Science and Engineering Research Board, GoI.

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