Seminar/Talk

Interactive Visualization of Planar Kaleidoscopic Orbifolds

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Host: Chris Wojtan

Orbifold is a modern mathematical concept that has been used to understand the geometric structures of hyperbolic geometry and prove the famous Poincar\'e conjecture for the three-dimensional case (the last and the hardest case). Orbifolds contain intricate structures which not only render orbifolds an interesting subject but also make their understanding challenging.In this paper, we provide an interactive visualization system for a class of important orbifolds: {\em kaleidoscopic orbifolds}. With the system, the user can create kaleidoscopic scenes of arbitrary complexity and interact with the objects in the scene to gain critical insights on kaleidoscopic orbifolds. Our visualization techniques are based on mirror reflections, a metaphor that is conceptually well understood by an average user. Furthermore, we develop interactive games to help the user better understand the properties of kaleidoscopic orbifolds. Our visualization system and interaction techniques are useful to gain intuitive comprehension of important concepts and properties related to orbifolds such as groups, group actions, branched covering spaces, and the result that all planar kaleidoscopes have a zero Euler characteristic.To test the efficiency of our system, we have conducted a user study, with the users being high school and college students as well as professors in mathematics teaching differential geometry, abstract algebra, and topology.

Tuesday, July 9, 2019 11:00am - 12:00pm
Mondi Seminar Room 2, Central Building

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