Mathematics Colloquium

The Geometry of Thales Contours

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Building 53 Room 206

Abstract

When you stand in place and look around, what you are able to see is the projection of your surroundings onto a two-dimensional sphere centered at your eyeball, and each object you can see takes up a certain percentage of the surface area of your field of view. For example, sitting at my desk, my rectangular window takes up about 25% of my field of view, subtending a solid angle of π steradians. Where else, I ask myself, could I put my eyeball so that the window subtends this same solid angle? We will refer to this set of possible eyeball positions–apparently a surface in $\mathbb{R}^3$–for which this solid angle measure stays constant as a "Thales contour" of the window.

This talk will study the geometry of Thales contours, in two dimensions (in which the ancient Greek mathematician Thales of Miletus proved his eponymous theorem), in the three-dimensional setting described above, and abstractly in higher dimensions. By design, the results I will present raise more questions than they answer, and will hopefully provide many accessible research directions in a variety of mathematical subject areas.

About the speaker: Stepan Paul is a former faculty member of the Cal Poly Math Department, and, as of today, is in between jobs as a Lecturer at UC Santa Barbara and a Preceptor at Harvard University. His current research focus is in undergraduate math education, where he is studying the role of spatial reasoning in multivariable calculus. In his spare time, he can be found on Santa Barbara's roads, trails, or beaches, on a bike, on a run, or in a wetsuit.