Name(s)
Anastasia L. Reshetikhin

Project Number

S1699

Project Title
The Non-Linear Optics of Interfaces in R^3

Abstract

Objectives/Goals
To model the distortion of an image through a spherical interface.

Methods/Materials
Assuming that the object in question is a photograph of a cat composed of pixels, I used trigonometry, geometry, and Snell's Law to obtain a function (the distortion function) that gives the perceived position of the pixel given the original position of the pixel. Then I used Mathematica (a computer program) to model the distorted image of the cat according to how a fish in a sphere of water would perceive it.

Results
Assuming that the object in question is a photograph of a cat composed of pixels, I used trigonometry, geometry, and Snell's Law to obtain a function (the distortion function) that gives the perceived position of the pixel given the original position of the pixel. Then I used Mathematica (a computer program) to model the distorted image of the cat according to how a fish in a sphere of water would perceive it.

Conclusions/Discussion
Interfaces of different materials distort images. I demonstrated that, using geometry, programming, and laws of optics, one can model the distortion of an image. As a result, one can find the actual location of an object on the other side of an interface using the perceived (or distorted) location. This can be applied to marine observation.

Summary Statement
I modeled the distortion of an image through a spherical interface.

Help Received
My brother introduced me to the Mathematica program. My mother proofread the text of the project.