Practitioner's Commentary: The Outstanding Helix Intersections Papers

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The problem statement is straightforward and clear, except for the description of the helix. All of the Outstanding papers assumed a cylindrical helix, which is probably the intent of the problem, but an elliptical helix could be used.

The mathematical reduction used by the Macalester College team is the usual way to do surface-curve intersections in general: Implicitize one surface (in this case the plane), and parametrize the curve (the helix). The intersection points can then be expressed by solving the equation generated when the parametrized form satisfies the implicit equation.

An alternative to the numerical solution of the resulting equation is to use a rational quadratic parametrization (instead of trigonometric) for the helix and end up with a polynomial function to solve.

The team from Iowa State University used a similar strategy but with a different root-finding approach.

The team from Harvey Mudd College used an approach that gets closer to (but didn't quite find) a different alternative: Intersect the cylinder the helix lies on with the plane, and then intersect the helix and that ellipse. The approach that the team took is correct but is limited to finite pieces of helix.

In summary, all three teams provide correct solutions, with slightly different limiting assumptions. The main differences in the solutions are in root-finding strategies.

About the Author

Dr. Malraison started out in (professional) life as a category theorist but saw the error of his ways and has been working in geometric modeling and CAD for the last 18 years. His current interests are generative languages and geometric constraints.