Parametric Design of a Helical Ramp for Elevated Bicycle Highways

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In the pursuit of developing sustainable and efficient transportation options, bicycle highways have emerged as an innovative solution. To improve the functionality of such highways, helical ramps are essential. For a total of six primary input parameters the model yields a 3D model of the desired helical ramp.

Background

In an era of rapid urbanization and growing environmental awareness, the demand for innovative and efficient transportation solutions has become more pressing than ever.
In the quest to create sustainable and efficient transportation options, elevated bicycle highways have emerged as an innovative solution. The bike highways are elevated approximately 6 m above the ground, eliminating the need to stop at intersections. With an inclination of 6%, an access ramp has a length of 100 meters. However, finding space for these ramps in urban areas can be challenging.

Design Concept

The columns are realized as vertical truss-systems keeping the material usage low and to be able to connect the high moments from the cantilever beams via the upper and lower chord of the truss. The cantilever beams come in pairs and are lying outside of the plane of the truss system, one on each side of the column. This allows for prefabrication of the truss as a single unit in the workshop and easy transportation to the construction site.
The warped deck surface is made from elements that consist of radial glulam ribs and a three layer solid wood panel. The driving surface features a four layered coating based on polyurethane. The coating is lightweight and stretchable, enabling the deck to be produced efficiently in the flat and only bent onto the helical surface once the helical ramp is erected.

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