

01234 Differential Geometry with Applications

Project Exercise: The Wankel Engine

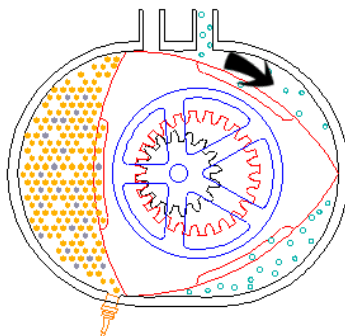


Figure 1: The Wankel Engine.

1 Wanted

The key idea of a Wankel engine is the application of a specific curve of constant *width*. What is the general definition of curves of constant width? How are such curves constructed? What are their properties? How does such a curve roll on a straight line? How does the Wankel engine work? What is the use of Barbier's theorem, which says that a curve of constant width μ has the perimeter $\pi\mu$?

2 Methods involved

Fourier analysis is a nice tool for unfolding the theory of curves of constant width, see [2] and [3]. But the applications of Fourier analysis to the geometry of planar curves go much further. A possible full project exercise still under this headline could be to consider the so-called *Hyper-cycloidal expansion of closed convex curves* - please consult the consultant for further information in this direction.

2.1 Estimated specific types of work loads

- Theory: ***
- Maple: ***

References

- [1] A. Pressley, *Elementary Differential Geometry*, Springer, 2002.
- [2] J. C. Fisher, *Curves of Constant Width from a Linear ViewPoint*, Mathematics Magazine 60, (1987) no. 3, 131–140. Copies are available.
- [3] J. McGarva and G. Mullineux, *Harmonic representation of closed curves*, Appl. Math. Modelling, 1993, Vol 17, April, 213–218. Attached as HarmonicClosedCurves.pdf