

Systematic Non-Tree Codes: Rudiments

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Abstract

In this note the authors present an alternative to tree codes.

Consider the following construction. We draw a segment of length L , inclined at an angle θ to the x -axis. From its rightmost endpoint we extrude another segment of length L , inclined at 2θ to the x -axis. In this way we proceed to construct the piecewise linear curve - call it a segmented cycloid. We ask the question: how many (L, θ) segments are needed to touch base, that is, for the construction to wind around and reach the x -axis again, bent on itself. The answer turns out to be the (rounded down) integer part of

$$\frac{\pi}{\theta} - 1. \tag{1}$$

Figure 1 plots Equation (1) and thereby shows the largest value of the total number of segments such that their vertical projections remain positive. Next let several such segmented cycloids be drawn from a common origin, with increasing steps of θ . Finally, draw semicircles centered at the same origin, of different, increasing steps of radii. After a certain minimum radius, these semicircles will intersect cycloids of different θ values. Each intersection's (r, θ) pair is noted. For each given r beyond the minimum r , we will have several (r, θ) pairs since the θ values will be various. Treat r as the “depth” in the non-tree code and treat the corresponding intersecting θ values as giving the number of zero crossings of Rademacher functions that represent the transmitted signal. Thus we have a geometry which is not a tree (see [1]), but can yield a tree-code-like repeated code.

References

- [1] Anant Sahai. Anytime coding on the infinite bandwidth awgn channel: A sequential semi-orthogonal code. In *Proc. 2005 Conf. Inf. Sci. Syst.* Citeseer, 2005.

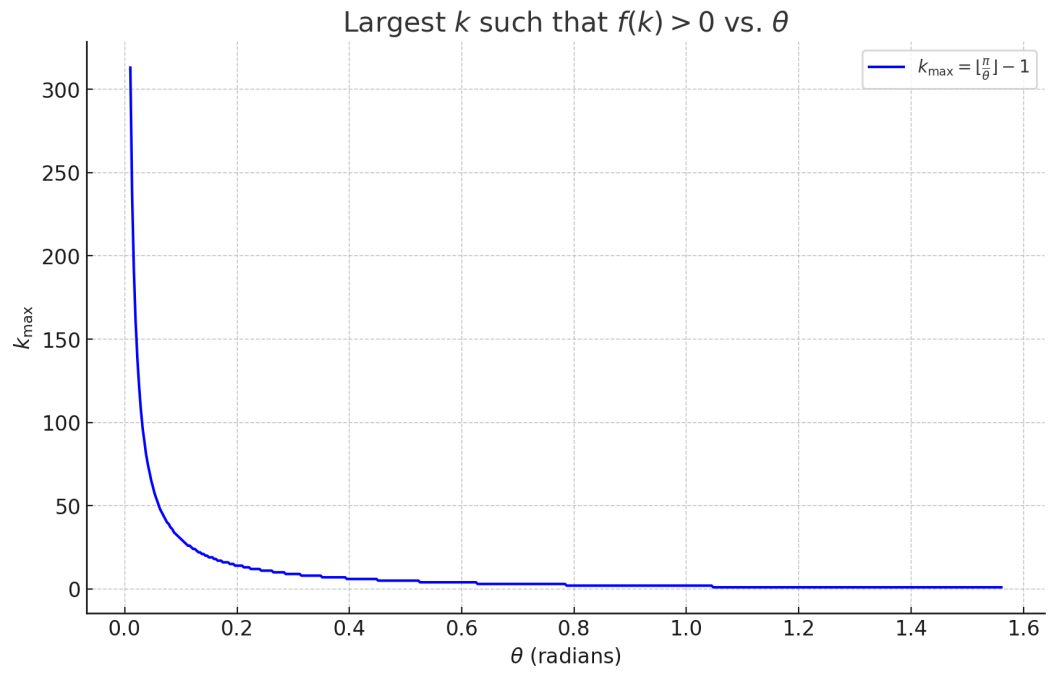


Figure 1: The figure shows the largest value of k such that the sum of the vertical projections is still positive, for different values of θ .