

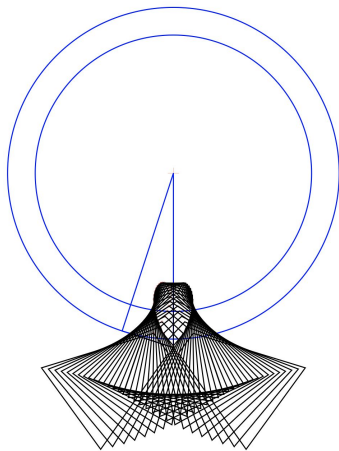
# Involute Spur Gear Builder

Dr. Rainer Hessmer, 9/12/2020

## Regular Gear

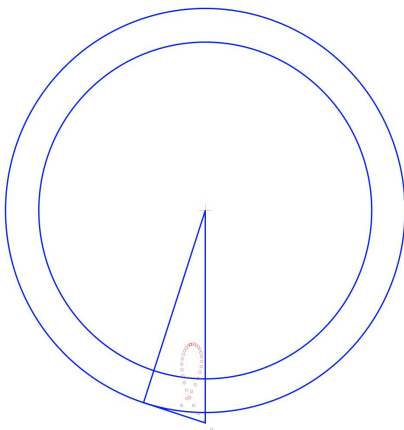
### Step 1:

Roll trapezoidal cutter and collect the paths (polygons):



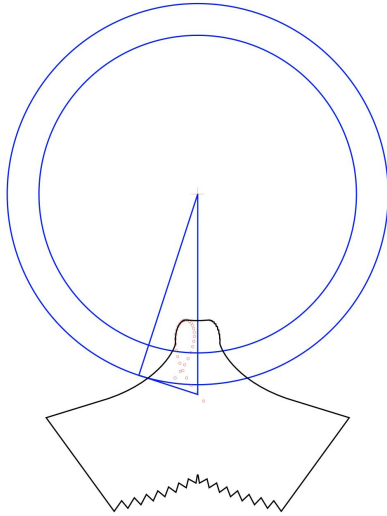
### Step 2

Create an additional path from the addendum corner of the cutter in the various positions (see red circles in figure below). Join the corners as a polygon. This ensures the undercut area is smoothly covered:



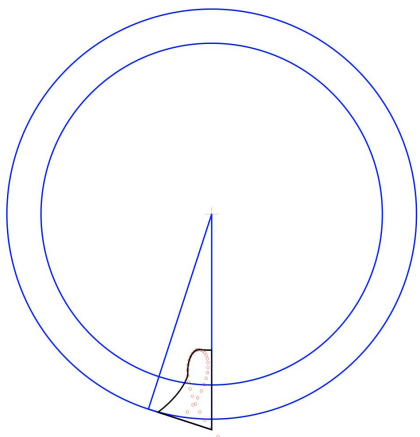
### Step 3:

Union all these polygons to create the 'tooth cutter':

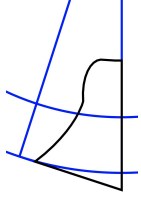


### Step 4

Create the intersection between the tooth cutter and the half-tooth triangle to create the half tooth path:



The lowest two points of the cutter shape will need to be brought onto the outer radius circle. They currently lie outside the circle:



## Step 5

Simplify (lighten the path) to remove points that are not needed to achieve the desired accuracy.

## Step 6

Calculate the intersections with the outer circle and create the trimmed path,

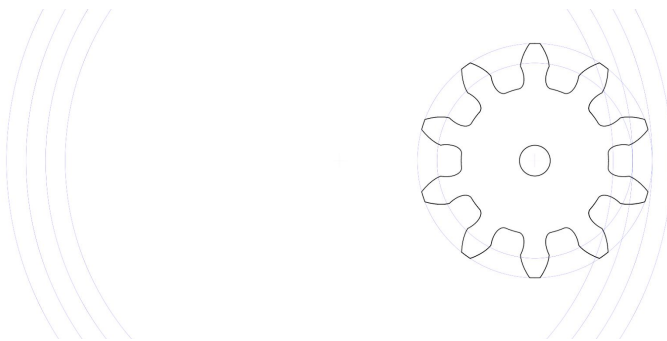
## Step 7

Mirror the path and combine both the original and mirrored path.

# Inner Gear

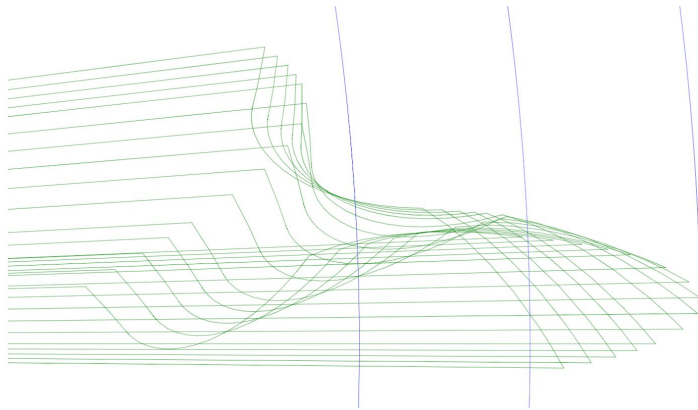
## Step 1

Create the matching pinion gear but with flipped clearance and backlash so that it can be used as the cutter of the inner gear.

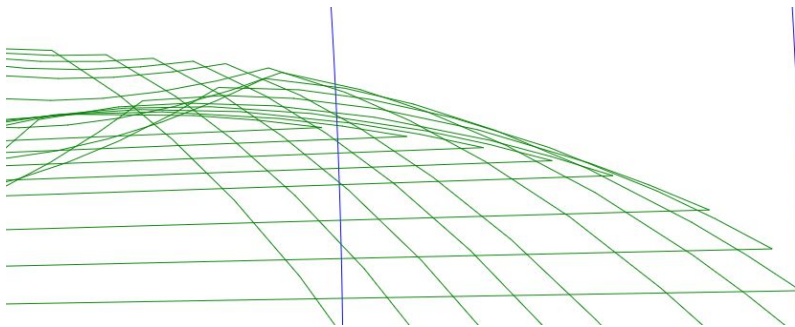


## Step 2

Roll the generated pinion shaped cutter to create various cutout paths:

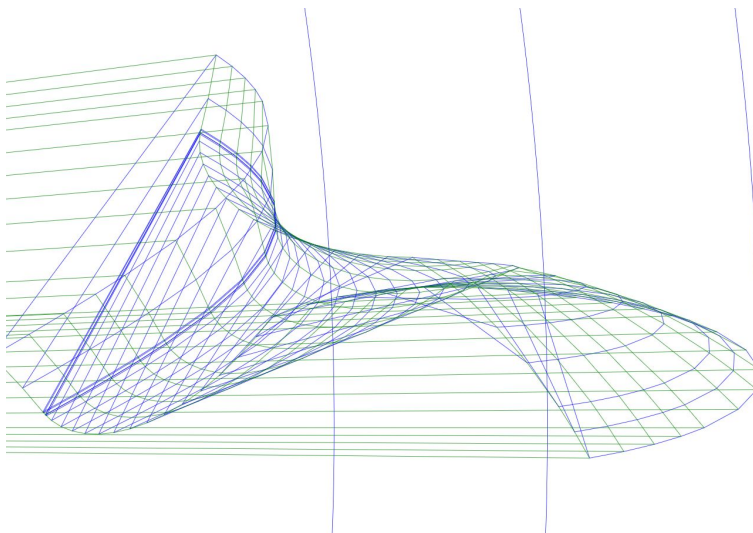


Just unioning these would result in ragged edges (see left top part in the image):

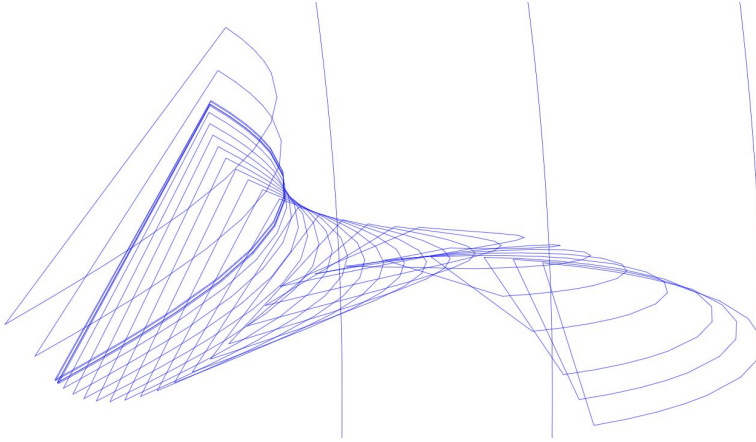


### Step 3

To avoid the ragged edges we can create shapes by connecting corresponding points in the rolled cutter shapes (the blue shapes in the image below):



The shapes are more clearly distinguishable without the the cutter paths:



Just unioning these is not enough either.

## Step 4

Union all the shapes from step 2 with all the shapes from step 3 to get a smooth overall shape.

The remaining steps are essentially identical to the steps described for the regular gear starting with [step 4](#).