

## Genus Two Knots\*

Torus knots, see the previous entry, are the most easily described knots and, in particular when viewed on a torus, they are also very easy to visualize.

If one wants to visualize other knots on some surface, one needs more complicated surfaces than tori. From this point of view the next simplest knots can be put on a genus 2 surface. The surface we chose looks like two tori which are joined by a small handle. (The size of these tori is controlled by the parameters  $aa$  and  $bb$  as for torus knots.) The surface is implicitly described by an equation (see implicit surfaces in the surface category) and can be made fatter by increasing  $ff$ . As examples of genus 2 knots we chose the connected sums of two  $(dd, ee)$  - torus knots. The sign of  $hh$  controls whether the two torus knots are connected with reflectional symmetry or with  $180^\circ$  rotational symmetry. The two simplest examples are the *Square Knot* and the *Granny Knot* where two  $(3, 2)$  - torus knots (=Trefoil Knots) are connected with the two types of symmetry.

The sum of the two torus knots is first constructed outside the surface, then projected onto the surface and finally smoothed with a length minimizing algorithm. The result is good enough for tubes made with a Parallel frame, whereas the tube from the Frenet frame is not smooth.

H.K.

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\* This file is from the 3D-XplorMath project. Please see:

<http://3D-XplorMath.org/>