COMPUTING IMMERSED NORMAL SURFACES IN THE FIGURE-EIGHT KNOT COMPLEMENT

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Abstract. The theory of (embedded) normal surfaces is a powerful technique in 3-manifold topology. There has been much recent interest in extending the theory to immersed surfaces, in particular to attack the word problem for 3-manifolds. Progress in this area has been hindered by the lack of nontrivial examples. This paper and a related work cover a particular example in depth, using methods which may be generalized. We give detailed information on the existence of immersed surfaces in the figure-eight knot complement using nontrivial computational techniques. After an introduction to the theory, introducing some new concepts, we discuss some strategies for enumerating surfaces of low genus, which have been implemented in software written by the author. The results are tabulated and an unusual example discussed.