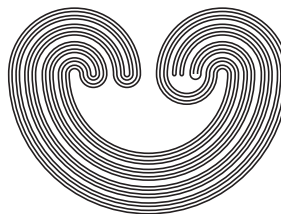


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## ANY NONTRIVIAL KNOT PROJECTION WITH NO TRIPLE CHORDS HAS A MONOGON OR A BIGON

by

NOBORU ITO AND YUSUKE TAKIMURA

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## ANY NONTRIVIAL KNOT PROJECTION WITH NO TRIPLE CHORDS HAS A MONOGON OR A BIGON

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**ABSTRACT.** A generic immersion of a circle into a 2-sphere is often studied as a projection of a knot; it is called a knot projection. A chord diagram is a configuration of paired points on a circle; traditionally, the two points of each pair are connected by a chord. A triple chord is a chord diagram consisting of three chords, each of which intersects the other chords. Every knot projection obtains a chord diagram in which every pair of points corresponds to the inverse image of a double point. In this paper, we show that for any knot projection  $P$ , if its chord diagram contains no triple chord, then there exists a finite sequence from  $P$  to a simple closed curve such that the sequence consists of flat Reidemeister moves, each of which decreases 1-gons or strong 2-gons, where a strong 2-gon is a 2-gon oriented by an orientation of  $P$ .

### 1. INTRODUCTION

V. I. Arnold [1] (V. A. Vassiliev [16], respectively) introduces a theory classifying plane curves (knots, respectively) in vector spaces generated by immersions  $S^1 \rightarrow \mathbb{R}^2$  ( $\mathbb{R}^3$ , respectively) divided by subspaces, called discriminants, each of which consists of curves (knots, respectively) with singularities. For the knot case, it is well known that every coefficient in the Taylor expansion  $t = e^x$  of the Jones polynomial is a Vassiliev invariant [2]. For plane curves, Arnold [1, p. 16, Remark] writes,

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*Key words and phrases.* knot projections; Reidemeister moves.

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