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Regularity of Schramm-Loewner Evolutions, annular crossings, and rough path theory

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(Submitted on 18 Jul 2011 (v1), last revised 18 Oct 2011 (this version, v2))

When studying stochastic processes, it is often fruitful to have an understanding of several different notions of regularity. One such notion is the optimal H\"older exponent obtainable under reparametrization. In this paper, we show that the chordal SLE_kappa path in the unit disk for kappa less than or equal to 4 can be reparametrized to be H\"older continuous of any order up to 1/(1+kappa/8).

From this result, we obtain that the Young integral is well defined along such SLE paths with probability one, and hence that SLE admits a path-wise notion of integration. This allows for us to consider the expected signature of SLE, as defined in rough path theory, and to give a precise formula for its first three gradings.

The main technical result required is a uniform bound on the probability that a SLE crosses an annulus k-distinct times.

Comments:	25 pages, 3 figures
Subjects:	**Probability (math.PR)**
MSC classes:	60J67 (Primary) 60H05 (Secondary)
Cite as:	**arXiv:1107.3524 [math.PR]**
	(or **arXiv:1107.3524v2 [math.PR]** for this version)

Submission history

From: Brent Werness [view email]
[v1] Mon, 18 Jul 2011 18:49:08 GMT (46kb)
[v2] Tue, 18 Oct 2011 05:19:40 GMT (47kb)

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