math*overflow*

differential geometry using Robinson's infinitesimals?

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Is there a detailed treatment of differential geometry using Robinson's infinitesimals?

reference-request	dg.differential-geometry	nonstandard-analysis

edited Feb 3 '16 at 16:00   asked Apr 2 '13 at 11:59

Shamisen   **Mikhail Katz**
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3   Since you specified Robinson, you might not be interested in the other type of infinitesimals (nilpotent).
    But Models for Smooth Infinitesimal Analysis by Moerdijk and Reyes treats a number of topics in
    differential geometry (using both invertible and nilpotent infinitesimals, but mainly the latter). –
    Todd Trimble ♦ Apr 2 '13 at 12:33

2   Differential geometry using the infinitesimals Todd mentions is known as synthetic differential geometry:
    ncatlab.org/nlab/show/synthetic+differential+geometry. There are a couple of online textbooks by Anders
    Kock listed there. – David Corfield Apr 2 '13 at 14:47

2 Answers

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I'm not aware of much. But two works worth noting are:

K.G. Schlesinger. Generalized Manifolds. Chapman & Hall/CRC, 1997.

I.O. Hamad. Generalized curvature and torsion in nonstandard analysis. PhD thesis, Salahaddin
University - Erbil, 2007.

Somewhat belatedly we developed foundations for differential geometry using infinitesimal displacements [here](#):

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Nowik, T.; Katz, M. "Differential geometry via infinitesimal displacements." *Journal of Logic and Analysis* 7:5 (2015), 1-44.

answered Feb 3 '16 at 13:08

Mikhail Katz
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