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An insight into the identifiability of material properties by instrumented indentation test using manifold approach based on P-h curve and imprint shape

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Abstract

Based on our recently proposed shape manifold identification procedure, we investigate the identifiability of material properties with instrumented indentation test using diverse indenter shapes (conical/spherical) and simulation setups (prescribed force/displacement). We extend the protocol by taking into account both imprint and P-h curve, dissect the difficulties of material characterizing and re-stress the non-uniqueness of solution to an inverse identification. This work highlights the manifold approach in estimating the maximum number of independent material parameters that may be determined from an indentation model. The observations are verified by identification procedure using synthetic data over successive local manifolds defined in respective shape spaces.

Keywords: Identification, Indentation, Imprint mapping, P-h curve, Intrinsic dimensionality

1. Introduction

Instrumented indentation is a popular technique used for the assessment of material properties [1]. The basis principle is that a stiff indenter penetrates into a specimen (Fig.1)

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