Fast Computation: A Steady-State Simulation of Railways Ballasted Track Settlement

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Abstract

Geometry of ballast railways track is a major concern in railways safety and efficiency. Settlement of railways ballast has been studied to help railway infrastructure manager to keep infrastructure in shape and to prevent incident.

Ballast settlement is commonly studied with full size model or with numerical models. The numerical models are used to compute and study the accumulation of plastic strain in the geomaterials, especially in the ballast layer.

Laboratory models are commonly studied with local sinusoidal load. In the same ways, many of numerical simulation assume the train load as one static load repeated in cycle. Both of these approaches hide specificity of a mobile load and continuous evolution of the structure.

In opposition, classic numerical approaches of a mobile load need move load step by step on the structure and to compute evolution of structure on each step. This means a multiplication of computation time.

In this paper we propose to study railways ballast settlement with an innovative numerical approach. A steady state algorithm is used to compute the plastic strain in geomaterials and to study the behavior of railways ballasted track with an Eulerian approach. In this way we improve model efficiency considering the mobile load specificity and reducing computation time.