Estimation probability of derailment in tangent track under geometric conditions

Abstract:
Track irregularities greatly affect vibration of Rolling stock. it is not expected to have a track free of irregularities, because there are heterogeneity of materials track with depth and non-uniformity of stiffness along the route particularly in ballasted tracks. Random nature of track materials structure and effect of other elements such as maintenance condition, traffic load, etc. lead to random nature of track irregularities. Therefore it is essential to make statistical study on characteristics of this phenomenon in order to apply dynamic analysis of track and wagon condition and maintenance decisions. In this thesis, at first for the purpose of considering frequency distribution function and other statistic specifications of geometric parameters, it was assumed that all of the geometric parameters which are measured by track recording car, such as track gauge, alignment, longitudinal level, cross level, twist are uncertain. Afterward, tracks with random irregularities base on statistical specifications have been generated by MATLAB software and then by importing these random tracks in SIMPACK software as an input data and passing typical wagon on these tracks, Y/Q results have been registered. Finally, probability of derailment has been gotten by estimating of derailment limit state function and applying reliability methods. The final results shown that in tangent tracks the suitable frequency distribution for irregularities is "t location-scale" distribution. Also, this thesis covers reliability methods algorithm in estimation probability of derailment of typical wagon on tangent track.
Keywords: statistic specification of track irregularity, response surface method, derailment estimation, importance sampling method, derailment limit state function, SIMPACK software.