

## Metropolis-Hastings Sampling Approach for High Dimensional Testing Methods of Autonomous Vehicles

**Authors :** Nacer Eddine Chelbi, Ayet Bagane, Annie Saleh, Claude Sauvageau, Denis Gingras

**Abstract :** As recently stated by National Highway Traffic Safety Administration (NHTSA), to demonstrate the expected performance of a highly automated vehicles system, test approaches should include a combination of simulation, test track, and on-road testing. In this paper, we propose a new validation method for autonomous vehicles involving on-road tests (Field Operational Tests), test track (Test Matrix) and simulation (Worst Case Scenarios). We concentrate our discussion on the simulation aspects, in particular, we extend recent work based on Importance Sampling by using a Metropolis-Hasting algorithm (MHS) to sample collected data from the Safety Pilot Model Deployment (SPMD) in lane-change scenarios. Our proposed MH sampling method will be compared to the Importance Sampling method, which does not perform well in high-dimensional problems. The importance of this study is to obtain a sampler that could be applied to high dimensional simulation problems in order to reduce and optimize the number of test scenarios that are necessary for validation and certification of autonomous vehicles.

**Keywords :** automated driving, autonomous emergency braking (AEB), autonomous vehicles, certification, evaluation, importance sampling, metropolis-hastings sampling, tests

**Conference Title :** ICIVVS 2017 : International Conference on Intelligent Vehicles and Vehicular Systems

**Conference Location :** Montreal, Canada

**Conference Dates :** May 11-12, 2017