

NEW WASH-OUT ALGORITHMS FOR DRIVING SIMULATOR

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The paper deals with the washout algorithms of driving simulators. The simulators enable human beings to test the properties of vehicles or to train their control before they are manufactured in extremely realistic circumstances. The problem is that the movement of the platform is limited by its workspace. The washout algorithm realizes the most realistic movement of the simulator within the limited workspace. New improved washout algorithms are described and their improved properties are demonstrated by simulations.

Key words: *driving simulator, washout algorithm, on-line, off-line, frequency filter, causal, non-causal, motion splitting*

1. Introduction

Vehicles are typical machines where the interface and interaction with human beings are of crucial importance. Therefore it is not possible to design vehicles only based on technical properties but the important features of interaction with human beings must be taken into account. In order to test these human – vehicle interaction properties the special testing machines, so called (driving) simulators are used. The simulators enable human beings to test the properties of vehicles or to train their control before they are manufactured in extremely realistic circumstances. Simulators are machines that give human operators the (physical, psychological, visual etc.) feeling of ride in real vehicle under controlled situations and states of vehicles usage. Such experiments are perfectly repeatable, usually less expensive and especially safer than experiments with real vehicles in real situations.

According to their concept simulators can be basically divided into two groups – fixed based and motion based. Fixed based simulators only consist of the cockpit model and ensure only the audio-visual part of the simulation. Motion based ones add a real movement to give a driver on the board more realistic impression of driving. They consist of the cockpit model mounted on a platform that can move by a special mechanism (Fig. 1). The problem is that the movement of the platform is limited by its workspace. The system that realized the most realistic movement of the simulator within the limited workspace is called washout algorithm.

2. Driving simulators

Although there are many different simulators the basic structure can be usually described as it is shown on Fig. 2. Driver's actions like accelerating, braking or steering are sent to the

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