Wheeled-Vehicles velocity updating by navigating on outdoor terrains

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Abstract. This paper addresses the velocity control of wheeled-vehicles regarding the terrain features, beyond detection and avoidance of the obstacles as most current works do. Terrain appearance average is used to enable the wheeled-vehicle to adapt velocity such that, as speedy as possible, it safely navigates. The vehicle velocity adaptation imitates the human beings' driving behavior regarding the terrain features: humans use a quick and imprecise estimation of the terrain features but enough to drive-navigate without sliding or falling. A Fuzzy Neural Network sets the vehicle velocity according to average estimations of terrain roughness. The terrain textures are modeled by the Principal Components which are enough to use pattern recognition for navigation purpose. One set of tests are executed using a small wheeled-robot which adjusts velocity while navigating on surfaces such as ground, ground with grass, and stones paving. The other tests are done using images of roads of ground, concrete, asphalt, and loose stones, which are video filmed from a real car driven at less than 60 km/h of velocity; by applying the present approach the required time/distance ratio to smoothly velocity change is granted.

Keywords: velocity updating, wheeled vehicles navigating, outdoor terrains roughness.