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STOCHASTIC PATH GENERATION GUIDED BY SACCADIC OBJECT DETECTION

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Abstract. *To implement anticipative road following process in vehicle systems, a stochastic perception-control coupling is introduced on the satellite-roadway-vehicle network. In this scheme, the random shift of the boundary probability is detected via the saccadic perception process and interpolated by using stochastic growth dynamics to generate continuous trajectories subjected to the unexpectable decisions of humans. The robustness and effectiveness of stochastic path generation scheme are evaluated through simulation studies.*

Keywords: Stochastic path generation, Anticipative road following, Saccadic boundary detection

1. **Introductory Remarks.** Since the earliest stage of robotics research, the real time integration of perception, decision and control processes is one of the central problems. Various types of machine intelligence have been developed in the context of autonomous decision making [18] as well as situation understanding [16] in naturally complex scenes. Despite the diversity of appearances, natural scenes exhibit environment specific landmarks to be identified within the context of the individual maneuver. To focus such a landmark object, first, the perception process should apply 'feature integration' schemes [2, 11, 14] to 'visual saliency' randomly distributed in complex scene images [5, 6, 12]. To match the scene image with the vehicle specific context, next, extracted saliency distribution should be articulated into a ground-object structure [8]. In the conventional integration scheme, various types of 'sensible saliency' including contours of well-defined objects and chunks of warning colors are extracted from scene images to identify the landmark objects through simultaneous self-localization and mapping (SLAM) [1, 3, 4], or an image based scene analysis [10, 13, 15, 19], e.g.

Recent advancements of large scale network systems combined with space technology make it possible to extend the scope of object identification beyond the physical-geometric perspective. For instance, we can exploit the satellite-roadway-vehicle (SRV) network as illustrated in Figure 1 on which machine vision systems installed in the vehicle segment are delegated and networked via the earth observation systems combined with the global positioning systems (GPS) to support the human understanding of global situations and subsequent decision making through interactive access to the roadway segment [7]. By applying a segmentation algorithm to multi-viewpoint images captured through the SRV network, we can simulate maneuvering processes from current scene localized in the satellite image to a possible destination as shown in Figure 2. In the implementation of such an anticipative maneuvering process, a robotic vehicle is dispatched to follow really existing roadway patterns on the satellite image as shown in Figure 3. As the result of the