

Dickmanns and Graefe (1988). **a) Dynamic monocular machine vision. b) Applications of dynamic monocular machine vision.**

Abstract a: a new approach to real-time machine vision in dynamic scenes is presented based on special hardware and methods for feature extraction and information processing. Using integral spatio-temporal models it bypasses the non-unique inversion of the perspective projection by applying recursive least squares filtering. By prediction error feedback methods similar to those used in modern control theory all spatial state variables including the velocity components are estimated, only the last image of the sequence needs to be evaluated thereby alleviating the real-time image sequence processing task.

Abstract b: The 4-D approach to real-time machine vision presented in the companion paper (Dickmanns and Graefe 1988 a, this volume) is applied here to two problem areas of widespread interest in robotics. Following a discussion of the vision hardware used, first, the precise position control for planar docking between 3-D vehicles is discussed; second, the application to high speed road vehicle guidance is demonstrated. With the 5 ton test vehicle VaMoRs, speeds up to 96 km/h (limited by the speed capability of the basic vehicle) have been reached. The test run available, of more than 20 km length, has been driven autonomously several times under various weather conditions.

Preface: This report presents a novel approach to dynamic vision which has been developed at the Institutes of the authors over the last ten years. The general method and its background is discussed in the first part. The second part contains more details on two of the four applications investigated. Most of the material has been published in papers separately. This report is the first attempt to cover the method, the hardware developed and results achieved in a survey fashion. The contributions of our research associates are appreciated. The references to both papers are given at the end of this report. Especially the six dissertations may be a good source for still more detailed information.