Computer Aided Reverse Engineering

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Abstract - In this paper, methodologies and technologies for automating reverse engineering (RE) through digital imaging and computer vision are presented. The paper begins with a definition of RE in terms of generating computer-aided design (CAD) models from existing objects and components. The term computer-aided reverse engineering (CARE) is used to describe this process. With this definition, a brief overview is presented regarding the traditional approach to RE using coordinate measuring machines (CMMs). The main focus of this paper is to explore digital imaging and computer vision as an alternative to CMMs. This exploration begins with data acquisition, where the present laser-based range scanners act as a promising approach. For these scanners, explanation and highlight differences in data resolution and scanning rates and contrast those to CMM performance are presented. Next, a processing pipeline for creating CAD models using these scanners are presented. This processing includes tasks such as view registration, surface integration, patch reconstruction, model fitting, noise removal, and other functions. This paper explains these topics to help the reader understand their importance in designing an RE imaging system and the impact that various parameters have on modeling accuracy.