

SEMANTIC NETWORK REASONING FOR PICTURE COMPOSITION

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ABSTRACT

To design an intelligent graphics system, conceptual information has to be represented and reasoned about. This paper explores knowledge representation schema, tools and techniques which are necessary for creating such a system. We will present a system that allows us to relate the meaning of a picture to its graphic representation. Two major blocks of the system are responsible for abstract reasoning about a picture and for picture composition respectively. We will show how a Semantic Network formalism and Semantic Network-based reasoning can be employed to allow abstract reasoning about a picture. How based on conceptual level information, the system reasons about appropriate scene composition and image generation. A smooth transition from conceptual level information to the actual picture composition is also achieved. We introduce a simple environment in which we have tested our approach. Within the constraints of this environment our system reasons about abstract non-visual concepts, decides which physical objects should be displayed, and renders them into an image.

KEYWORDS:

Intelligent graphics system; Knowledge representation; Temporal reasoning; Scene composition.

1. Introduction

Current graphic systems place the tasks of scene composition and object formation on the user. Their performance is limited to the representation of an image that was fully determined by a programmer. The situation would improve when, instead of burdensome testing of different versions of an image, the user could obtain some assistance in deciding about

the user could obtain some assistance in deciding about graphic presentation from an intelligent computer graphics system.

In order for a system to provide such assistance, it should have some knowledge about the nature of the objects which user wants to display. In many cases, the user may wish to give only abstract specifications of the picture he wants to see. How does a system decide **what** to display and in what **form** it should be displayed? What kind of knowledge representation and reasoning mechanisms do we need to cope with this problem? How does one go from abstract specification of the picture to the actual image being generated? In this paper we will try to answer some of these questions and present a design of a system which is responsible for the appropriate picture composition and generation.

To create an intelligent graphics system, tools must first be developed which integrate techniques from the fields of Artificial Intelligence and Computer Graphics in a coherent manner [2]. Our system consists of two modules. Reasoning and determination of the conceptual specifications for the picture is facilitated by the Semantic Network Processing System (SNePS) [4]. SNePS allows us to create the conceptual knowledge base in the form of a semantic network and is capable of including rules of inference in the same representation. It decides on the appropriate meaning of the picture and on the objects which should therefore be included in the picture. SNePS passes this information to a graphics module (Graflisp [1]) along with some set of restrictions for the picture composition.

A graphics module is responsible for object generation, transformation and display rendering. Graflisp maintains knowledge of object structures and of inter-relationships between objects. Objects have a special class inheritance. This allows objects to be comprised of any forms which can be functionally defined, rather than limiting them to be built-up from a polygonal base. Users may define and link their own classes to the classes which are currently defined (polygons, spheres, surfaces of revolution, etc.). In addition to the smooth shading,

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