EXPERIENCES WITH USING PROLOG FOR GEOMETRY

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ABSTRACT

The Prolog language is a useful tool for geometric and graphics implementations because its primitives, such as unification, match the requirements of many geometric algorithms. We have implemented several problems in Prolog including a subset of the Graphics Kernel Standard, convex hull finding, planar graph traversal, recognizing groupings of objects, and boolean combinations of polygons using multiple precision rational numbers. Certain paradigms, or standard forms, of geometric programming in Prolog are becoming evident. They include applying a function to every element of a set, executing a procedure so long as a certain geometric pattern exists, and using unification to propagate a transitive function. Certain strengths and weaknesses of Prolog for these applications are now apparent.

RÉSUMÉ

Le langage Prolog est un outil très utile pour la conception de logiciels géométriques et graphiques. Ceci est dû au fait que ses primitives, comme par exemple l'unification, répondent bien aux exigences de nombreux algorithmes géométriques. Nous avons résolu en Prolog plusieurs problèmes dont la représentation d'un sous-ensemble de la norme graphique Kernel, la détermination d'enveloppes convexes, le traitement de graphes plans, la reconnaissance de familles d'objects et la réalisation de combinaisons booléennes de polygones utilisant des nombres rationnels à précision élevée. Certaines hypothèses ou formes standard de programmation deviennent évidentes en Prolog. Ceci est vrai entre autre pour l'application d'une fonction à tous les éléments d'un ensemble, l'exécution d'une procédure tant qu'un certain motif géométrique existe et l'utilisation de l'unification pour la propagation d'une fonction transitive. Certaines forces et faiblesses de Prolog vis à vis de ces applications sont maintenant apparentes.

KEYWORDS: Prolog, Geometry, Graphics Kernel Standard

INTRODUCTION

The fifth generation logic programming language Prolog[Clocksin81a, Coelho80a], appears appropriate for research in geometry and graphics. Some examples of its use in architectural design are given in [Swinson82a, Swinson83a, Swinson83b]. Its use in CAD has been evaluated in [Gonzalez84a]. Constructing geometric objects from certain constraints is described in [Brüderlin85a]. Over the past two years, the authors of this present paper have implemented several geometric and graphic problems in Prolog using assorted machines. This paper describes the experiences, including some paradigms of programming that have appeared useful, and finally listing the advantages and disadvantages of Prolog that we have experienced.

Over the last two years we have implemented several graphics and geometric algorithms in Prolog, totally a few thousand lines of code, using four different Prolog interpreters on four different computers. The systems include:

Machine	Operating System	Prolog Version
IBM 3081	Michigan Terminal System	York (U.K.)
IBM 4341	CMS	Waterlog
Prime 750	Primos	Salford
VAX 780	Unix bsd 4.3	UNSW

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