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Subject: ONR QUARTERLY PROGRESS REPORT;
Second Quarter Period, June - August 1991

N00014-91-J-1500

Title: Automating a Detailed Cognitive Task Analysis for Structuring Curriculum

Activities: To date we have completed task 1.1 and task 1.2 of the Research Plan (see attachment 1 Research Plan for Year 1). Tasks 1.1 and 1.2 have led to the development of a taxonomy of methods employed in the knowledge acquisition process (see attachment 2). We have identified constraints as a set of characteristics defining the knowledge acquisition process employed by these various methods. The vast majority of these characteristics are specific to the particular method employed. However, we have been able to identify a set of characteristics which are common to many systems and which we intend to employ in the design and development of our system.

We have submitted and have had accepted a paper which presents our conceptual analysis and taxonomy for the annual conference of The Institute for Management Sciences. Although the particular application of the modified GOMS cognitive task analysis technique under development is for structuring curriculum, it has become apparent that this technique and the system under development can be utilized for generating problem space representations for problem solving tasks. Since management behavior can be characterized largely as problem solving and planning, considerable interest has been generated for this particular effort.

As our Research Plan indicates we expect to complete a process flow diagram of the system logic by the end of September. We have generated an initial draft and several versions of this process flow diagram. Our latest version is presented as attachment 3.

David Kieras visited Blacksburg on the 26th and 27th of August to assist us in our efforts given his experience in the systemization of GOMS. The results of our discussions have led to the understanding that we are extending the GOMS analysis developed by David. The extension includes the capability to integrate exception rules within the analysis. These exception rules would serve to break the strict hierarchy imposed on productions as they are generated employing a typical GOMS analysis. This extension allows GOMS to be generalized to applications which are not strictly hierarchical in nature.

An area of interest which you may wish to consider for psychological research is the determination of the strategy/strategies which experts employ in retrieval and recall of their expert knowledge bases when interacting with a knowledge acquisition system. We have some indirect guidance from the literature on programming and the design of software systems by experts relative to how knowledge for episodes is stored in memory and how experts search for information to solve problems. We are however, at a loss for anything that directly addresses the issue of how entire knowledge bases of expertise are unpacked from memory (i.e. top-down best first, top-down breadth first or depth first, bottom-up, etc.). We have assumed a top-down breadth first strategy primarily as a result of intuition and from the research in expert design of software programs. If you have any leads please inform.

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for public release and sale; its
distribution is unlimited.

Sincerely,

Kent E Williams

91-11332



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Management Systems Laboratories

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Automating a Detailed Cognitive Task Analysis For Structuring Curriculum: Research Plan Year 1

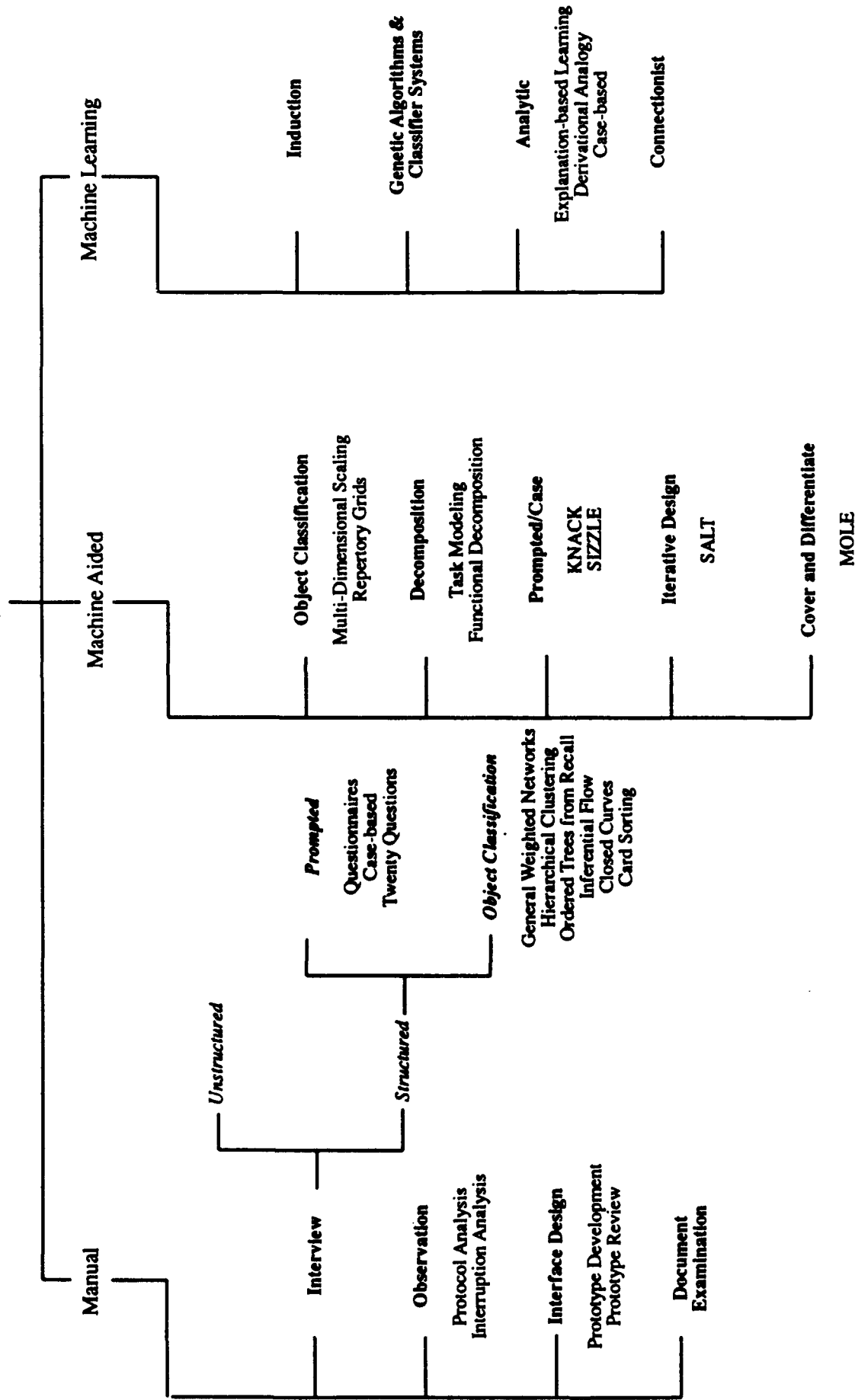
Task 1.0 Design

- Task 1.1 Conduct body of knowledge review relative to cognitive task analysis techniques and automated knowledge acquisition techniques.
Complete by end of July.
- Task 1.2 Analysis of cognitive task analysis methodologies and automated knowledge acquisition techniques to identify needed constraints for both elicitation and refinement.
Complete by end of August.
- Task 1.3 Chart process flow of design identifying constraints at each activity within the process flow diagram keeping in mind any interactions between activities and constraints.
Complete by end of September.
- Task 1.4 Select software package for implementation of process flow DOS compatible.
Complete by end of September.
- Task 1.5 Develop rules which will formalize process flow as a production system for both elicitation and refinement.
Complete by mid-December.
- Task 1.6 Specify interface requirements for user interaction for both inputs and outputs.
Complete by end of October.
- Task 1.7 Design and prototype interface.
Complete by end of January.
- Task 1.8 Conduct manual Simulation and Review of Design; develop a complete worked through example of an interaction with the system for review and critique of the design.
Complete by end of January.



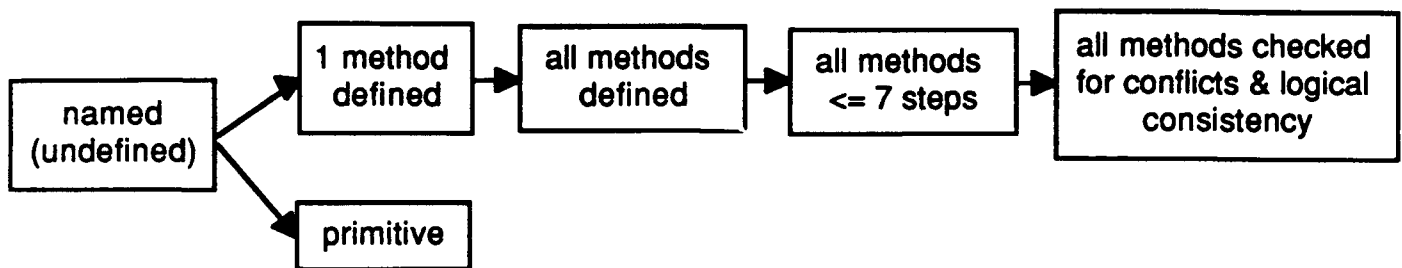
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KNOWLEDGE ACQUISITION METHODS

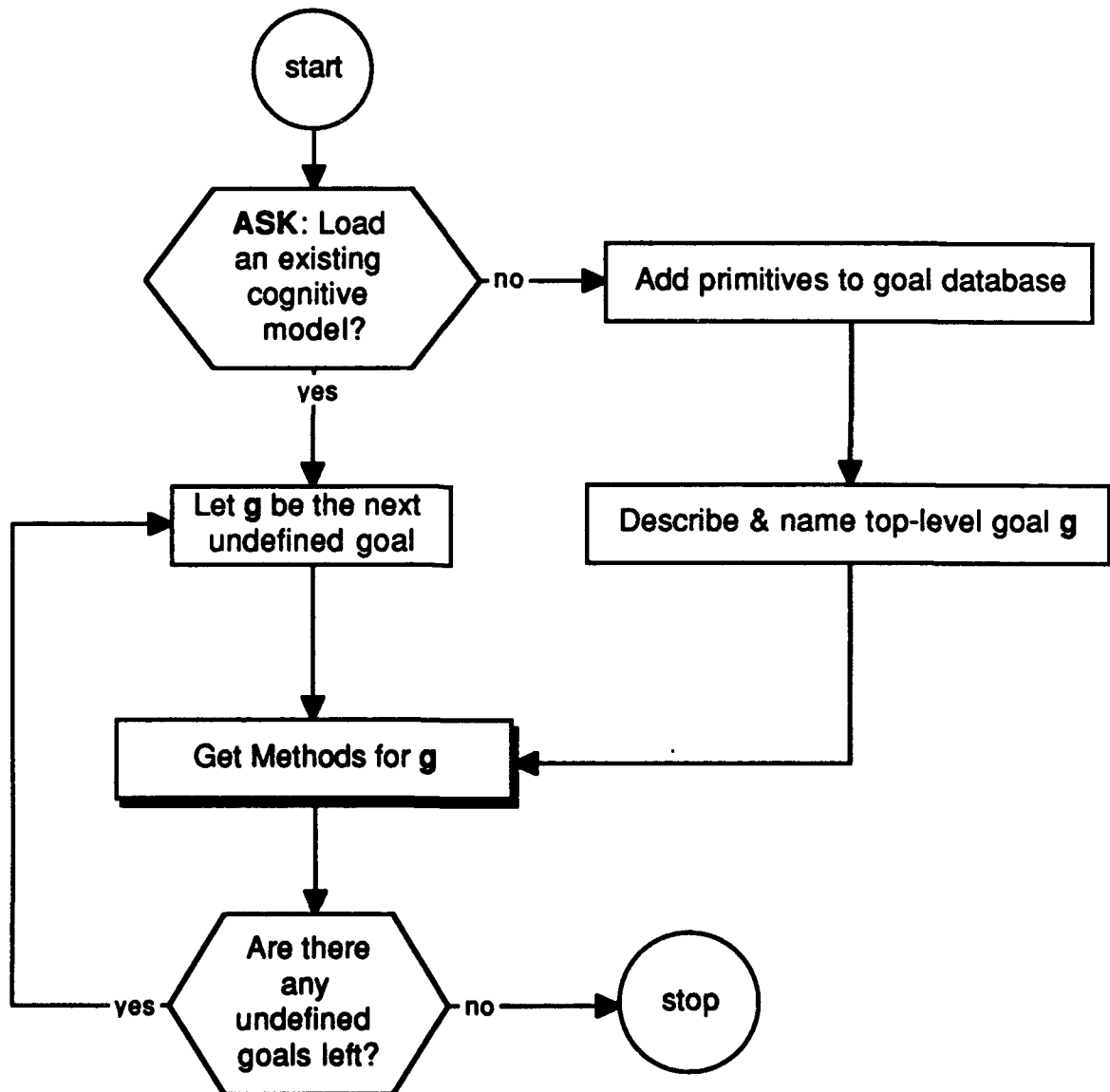


Cognitive Analysis Tool

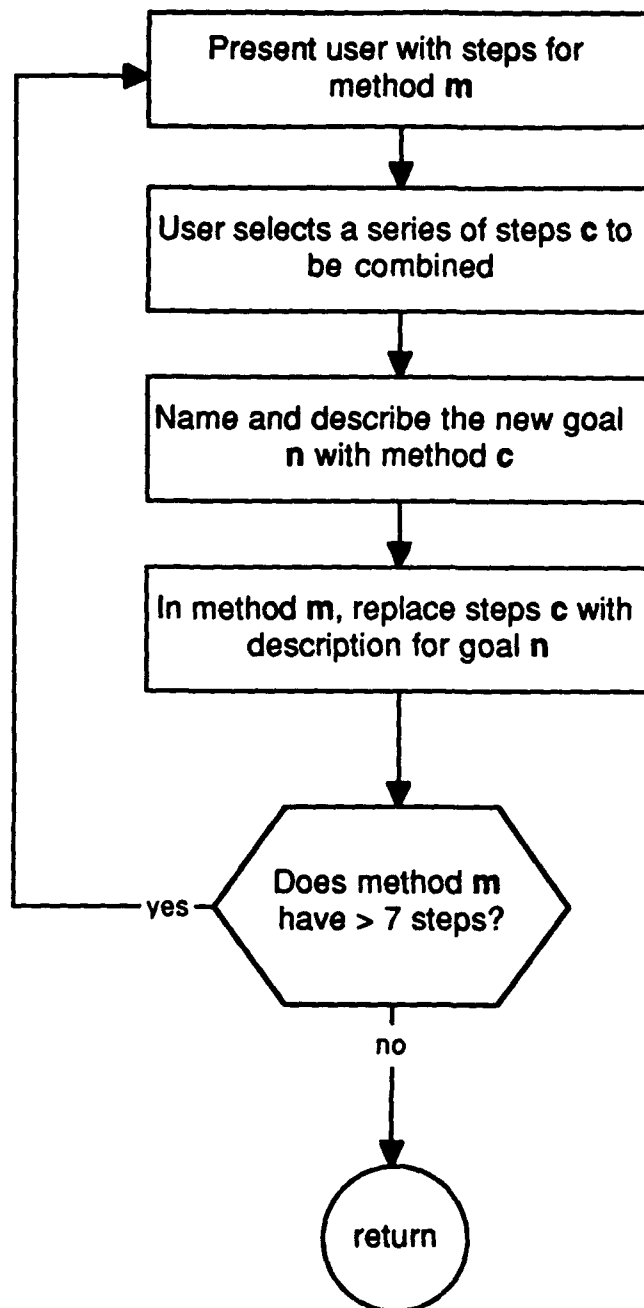
General Flow of Goal Refinement



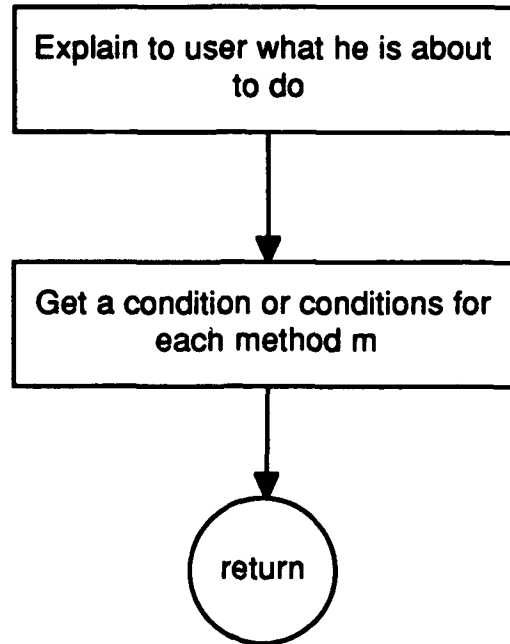
Flow of control



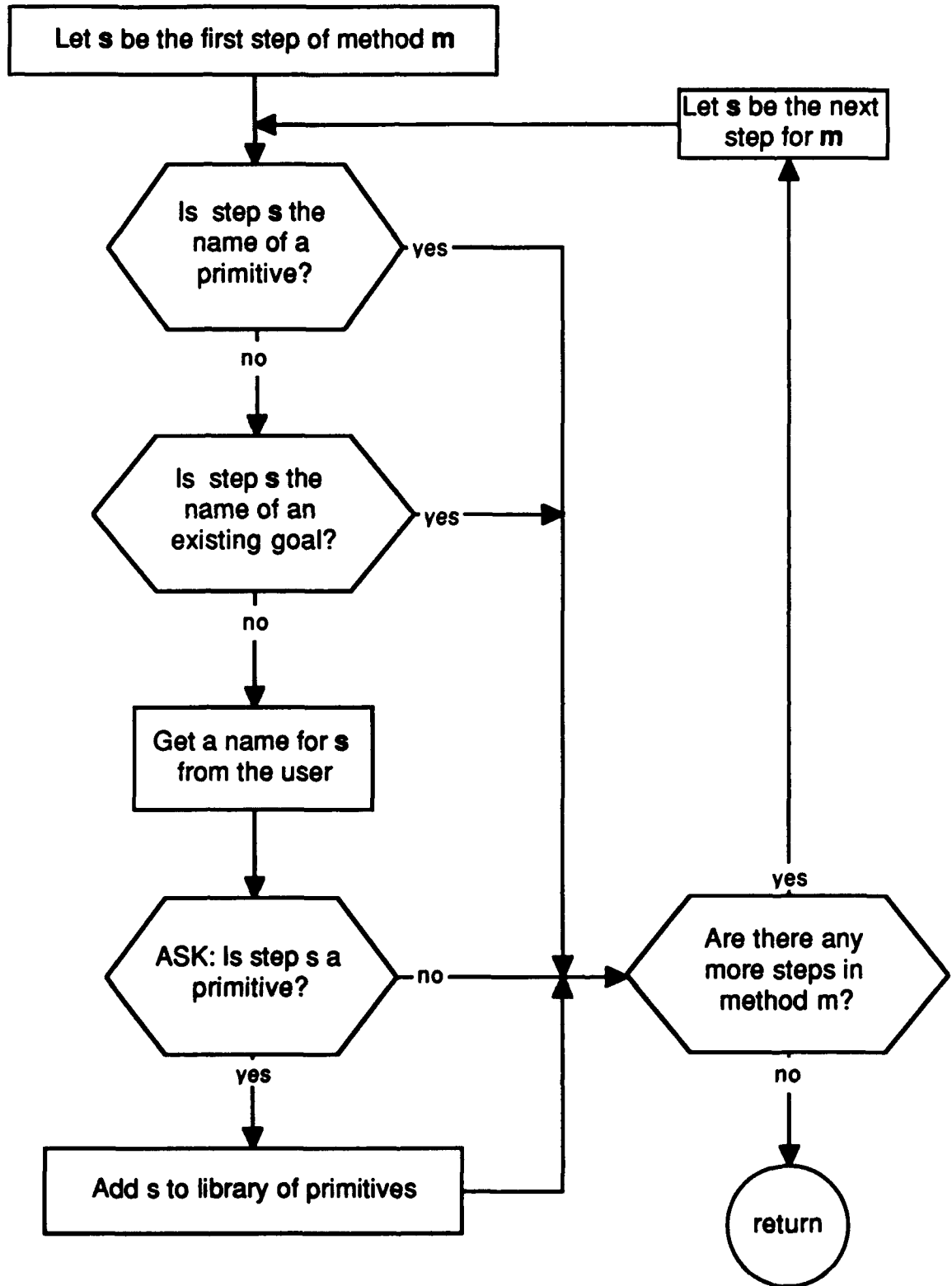
Consolidate the method



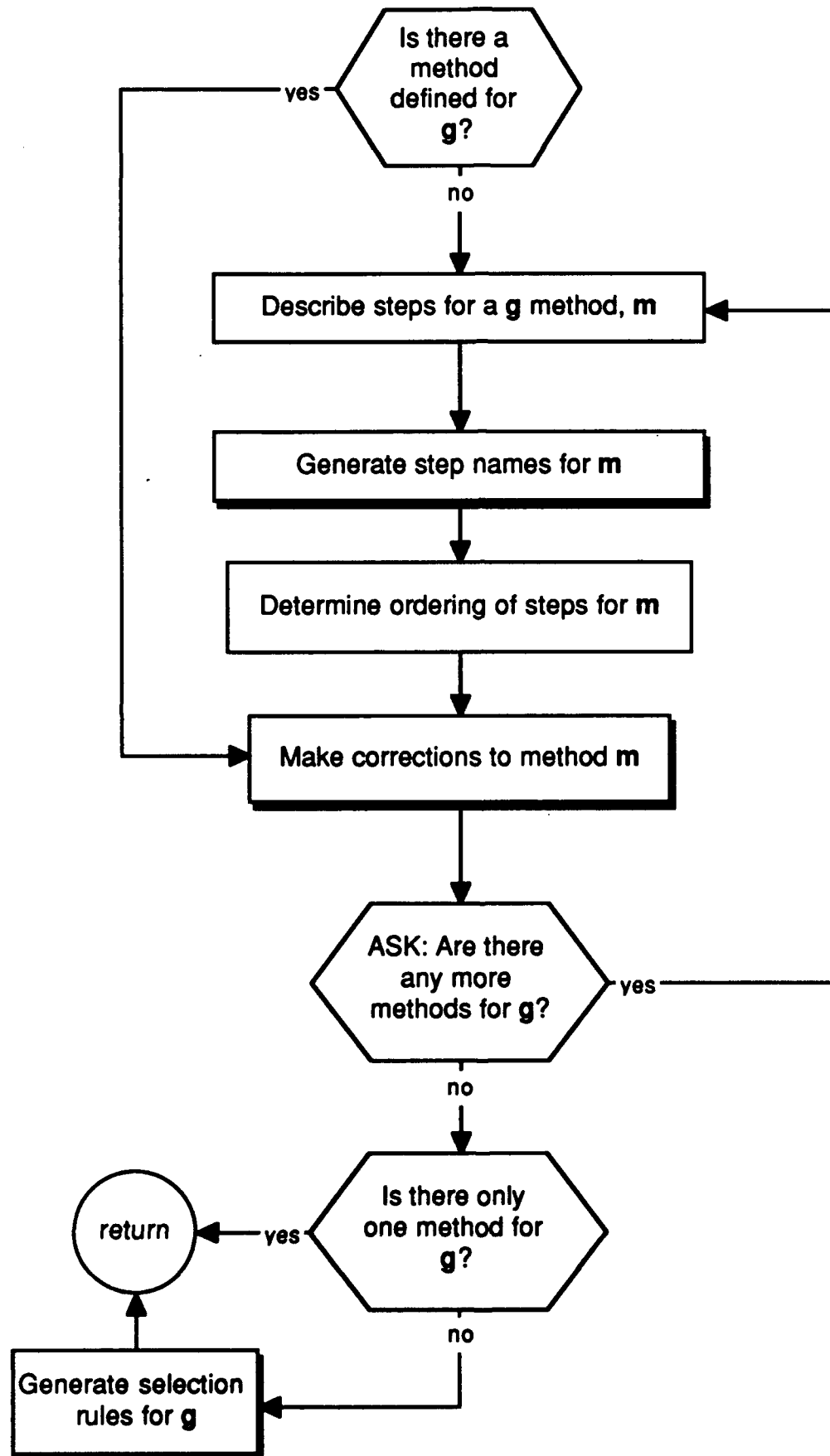
Generate selection rules for g



Generate step names for method m



Get methods for goal g



Make corrections to method m

