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## POLITICS: Automated Ideological Reasoning\*

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POLITICS is a system of computer programs which simulates humans in comprehending and responding to world events from a given political or ideological perspective. The primary theoretical motivations were: (1) the implementation of a functional system which applies the knowledge structures of Schank and Abelson (1977) to the domain of simulating political belief systems; (2) the development of a tentative theory of intentional goal conflicts and counterplanning. Secondary goals of the POLITICS project include developing a representation for belief systems, investigating cognitive processes such as goal-directed inferencing, and the integration of several types of knowledge representations into a functional system.

### INTRODUCTION AND BACKGROUND

POLITICS is an automated political belief system simulator. Given an event about a political conflict and an ideology to use in interpreting the event, POLITICS generates a full story representation, predicts possible future events, answers a variety of questions, makes comments about how the situation can affect the United States, and suggests possible courses of action to be taken by the U.S. A subset of POLITICS can function like Abelson's Goldwater machine (1965, 1973) solving many of the serious problems faced by Abelson's Goldwater simulator which had difficulty dealing with mundane reality. For instance, since Russia built the Berlin Wall, the program would predict that Castro would also build the Berlin wall. The original Goldwater machine understood the concept of "built-the-Berlin-Wall" only as some action done by Russia. Russia is communist. Communists do bad things. Therefore "built-the-Berlin-Wall" is a bad thing. Cuba is also Communist, ergo, Cuba would also build the Berlin Wall. There has been considerable progress since the late sixties in both theoretical insights and implementational mechanisms. The theory of predictive understanding and knowledge structures developed by Schank and Abelson (1977) underlies

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much of the implementation of POLITICS, distinguishing it from Abelson's earlier effort. Many of the problems of dealing with mundane reality have been solved by the use of scripts (discussed below) and by inferring the intention of the actors in the events being interpreted.

Several theoretical issues were encountered in the process of creating a working system. These issues led to some new ideas and representations such as the following: A functional representation for an ideology was developed which the programs can take easily as input data. This enables POLITICS to model any reasonable political ideology. Goal-directed inferencing processes were developed to interact with scripts, thereby making scripts more strongly predictive than in other implementations (e.g., Cullingford, 1977). Counterplanning strategies were investigated to a limited degree in order to model and understand the ways in which political entities often scheme to thwart each other's goals. Some new question-answering strategies were developed to interrogate hypothetical and predictive information. When POLITICS encountered previously unknown facts necessary to interpret an event, a limited form of learning about objects and political entities in the world model was developed to increase its effectiveness.

This paper focuses on three of the more significant aspects of the POLITICS project. The representation and function of political ideologies in understanding events is analyzed and proposed as a theory to account for differing ideological interpretations of the same event. Counterplanning strategies and rules are developed to model the process whereby countries or people scheme to prevent each other from achieving their respective goals. The encoding of mundane world knowledge as scripts and context-dependent inference rules is discussed in some detail where it applies to the processing of the sample political events.

There are some notational conventions which help us to read a POLITICS protocol: A “#” preceding a word means that the word represents a conceptual class of objects in POLITICS memory; for instance, #PERSON, #ORG (for organization), #COUNTRY, and #WEAPON are four of the fifteen classes of real world objects that POLITICS knows about. A word preceded and followed by asterisks is a pointer to a specific memory token. A “\$” preceding a word designates the name of a script.

## POLITICS: THE INTERPRETATION OF A POLITICAL EVENT

Here is the actual protocol in processing a political event. The computer output has been capitalized to distinguish it from input typed in by a person.

### *U.S.—Conservative Interpretation of Event (1)*

\*(INTERPRET US—CONSERVATIVE)

INPUT TEXT: The United States Congress voted to fund the Trident submarine project.

PARSING...COMPLETED.

INTERPRETING EVENT FROM A US—CONSERVATIVE IDEOLOGY.

INSTANTIATING SCRIPT: \$FUNDING

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO RECEIVE (\*MONEY\* AMOUNT (SUFF))

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO BUILD (#WEAPON TYPE (\*SUBMARINES\*) NAME (TRIDENT))

INFERENCE: \*US\* INCREASE IN MILITARY POWER

INFERENCE: GOAL OF \*US\* IS (#COUNTRY TYPE (\*COMMUNIST\*)) SIZE (LARGE)) TO FEAR \*US\*

INSTANTIATING SCRIPT: \$CONFRONTATION

INFERENCE: (#COUNTRY TYPE (\*COMMUNIST) SIZE (LARGE)) TO STOP EXPANDING POLITICAL-CONTROL

INTERPRETATION COMPLETED, READY TO ACCEPT QUESTIONS.

(1.1)

Q: What did the U.S. Congress do this for?

A: THE UNITED STATES CONGRESS WANTS THE UNITED STATES ARMED FORCES TO BE STRONGER.

(1.2)

Q: Why should the U.S. be stronger?

A: THE UNITED STATES ARMED FORCES SHOULD BE STRONG TO STOP COMMUNIST EXPANSION.

(1.3)

Q: What should the U.S. do if Russia builds nuclear submarines?

A: THE UNITED STATES SHOULD BUILD MORE SUBMARINES.

### *U.S.-Liberal Interpretation of Event (1)*

\*(INTERPRET US-LIBERAL)

INPUT TEXT: The United States Congress voted to fund the Trident submarine project.

PARSING...COMPLETED.

INTERPRETING EVENT FROM A US-LIBERAL IDEOLOGY.

INSTANTIATING SCRIPT: \$FUNDING

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO RECEIVE (\*MONEY\* AMOUNT (SUFF))

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO BUILD (#WEAPON TYPE (\*SUBMARINES\*) NAME (TRIDENT))

INFERENCE: \*US\* INCREASE IN MILITARY POWER

INFERENCE: (#COUNTRY TYPE (\*COMMUNIST\*)) SIZE (LARGE)) TO BUILD (#WEAPON TYPE (\*UNSPEC\*))

INSTANTIATING SCRIPT: \$ARMSRACE

INFERENCE: GOAL CONFLICT UNRESOLVED \*US\* AND (#COUNTRY TYPE (\*COMMUNIST\*)) SIZE (LARGE))

INTERPRETATION COMPLETED, READY TO ACCEPT QUESTIONS.

(1)

Q: What did the U.S. Congress do this for?

A: THE UNITED STATES CONGRESS FEARED FALLING BEHIND IN THE ARMS RACE.

(2)

Q: What will Russia do next?

A: RUSSIA WILL PROBABLY BUILD MORE WEAPONS.

(3)

Q: What should the U.S. do if Russia builds Submarines?

A: THE UNITED STATES SHOULD NEGOTIATE WITH RUSSIA TO STOP THE ARMS RACE.

Question (2) is different in each Q/A dialogue because in each case it is a follow-up of the respective answer to the first question.

### HOW POLITICAL IDEOLOGIES ARE REPRESENTED

A political ideology is chosen before the system inputs an event to interpret. The purpose of this is to try to determine how preconceived notions, such as political ideologies, affect the understanding of events relating to potential political or military conflicts. We do not attempt to formalize exact models of any given ideology. Ideologies are represented as goal trees attributed to the main actors in the political world. Goal trees determine the intentions which motivate the actions of countries and other actors in the political world such as military factions and political parties. The system uses these goal trees to predict what the actors intended to accomplish when POLITICS reads about an event describing their actions. Goal trees are also instrumental in predicting other goals which the political actors may pursue in the immediate future.

A goal tree is a set of goals for a given actor arranged in a hierarchy of importance and interdependence. More concretely, consider what the goal tree of the United States is in under a U.S.-Conservative ideology presently implemented in the POLITICS system. The primary U.S. goal is to maintain the Free World free from Communist domination. This goal has as subgoals military containment of Communist aggression, preventing Communist subversion from within, keeping technologically and economically ahead of the Soviet Union, and maximizing western influence in neutral nations. The first of these subgoals also has its own subgoals of maintaining military superiority and establishing (and maintaining) free world alliances. As the goal tree branches deeper, the goals become more specific and instrumental to the higher level goals. Under the current implementation for the Conservative ideology, the United States goal tree has 12 nodes; the Soviet goal tree has 11 nodes. The higher level goals for the Soviet Union are diagramed in Fig. 1.

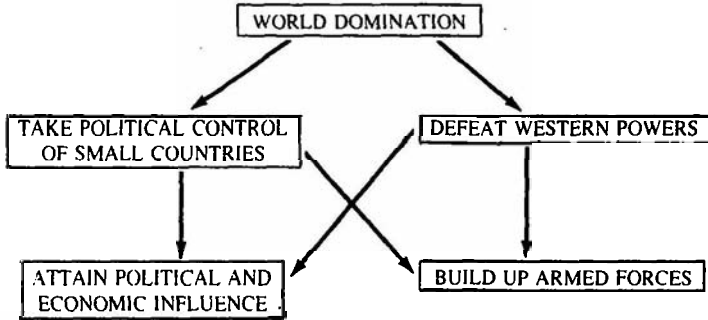


FIG. 1

It is possible for an actor to have two or more goals which may be ranked in order of importance, but neither need be a subgoal of the other. For instance, under the U.S.-Conservative ideology the United States may have the elimination of economic foreign aid as a low importance goal (e.g., stop wasting resources sending food to India). This goal does not fit into the subgoal hierarchy mentioned above for the United States. Therefore, one actor can have more than one goal-subgoal tree where the trees themselves can be arranged into a tree hierarchy as a function of importance. In practice, however, this extra mechanism does not seem necessary for POLITICS because an actor has usually only one active goal-subgoal tree. The internal representation for goal trees is a directed acyclic graph to economize on storage when a certain goal may be a subgoal of several higher level goals. All Third World countries are assigned the same pair of goal trees, where the top level goals are economic development and military supremacy over neighboring countries. Likewise, other western industrial countries and Communist countries are respectively assigned their own common goal trees. Although it is the case that each country of a given category (e.g., Third World nations) may have its own set of specific goals, we do not strive for such precision. It is unclear whether American politicians, whom we are trying to model, act on the basis of distinctions between the goals of the governments of the different Third World nations.

The above representation for political ideologies suggests that there may be no more to a political ideology than the set of goals which (the person subscribing to the ideology believes) each political entity has or should have. We implemented this theory in POLITICS and were encouraged by the results. One pragmatic implication of this theory is that the POLITICS system can handle different ideologies by simply constructing the respective goal trees and reading them into the system as data structures. In this way we have implemented the present Conservative and Liberal U.S. ideologies. A theoretical implication is that there should be no consistent differences in thinking processes or other cognitive behavior between people having different political ideologies if tested on cogni-

tive tasks irrelevant to political beliefs. Since we can only speculate on whether the POLITICS model really reflects the way in which people encode ideologies, we shall analyze the examples given above and let the reader consider the validity of our representation for political ideologies. There is some psychological evidence to suggest that the preconceived notions of the understander about the characters of a story play a crucial role in the understanding process. Owens, Dafoe, and Bower (1977) have psychological test results to this effect. Wilensky (forthcoming, 1978) has found the need to model the goals of each character in the intentional analysis of social interaction stories.

Our modular goal-oriented representation of ideologies is quite different from those of previous efforts: Abelson (1973) represents Senator Goldwater's political ideology as a rather simple master script. The master script is internally encoded in a procedural manner by a set of rules of the following form: If A then B in which case C to prevent D, where A, B, C, and D are categories of actions. Colby's (1973) representation of his belief system for PARRY appears to be distributed throughout his programs. His "belief system" is based largely on canned response phrases and on a story about persecution by the Mafia, which PARRY tells whenever it gets a chance.

### ANALYSIS OF THE POLITICS INTERPRETATION PROCESS

Consider once again the U.S.-Conservative interpretation of the Trident submarine event. The Conservative ideology has been chosen by loading all the appropriate goal trees into the system. A political event is typed in English and parsed into a conceptual dependency representation (Schank, 1972) by the POLITICS conceptual analyzer, a special purpose version of Riesbeck's (1975) conceptual analyzer. The internal mechanisms of the POLITICS parser are not of primary interest to the issues described in this article. Some special purpose routines which query memory were added to the parser in order for it to produce memory representations like the one exhibited below. These routines are specific to the domain of political events.

\*(INTERPRET US-CONSERVATIVE)

INPUT TEXT: The United States Congress voted to fund the Trident submarine project.

PARSING...COMPLETED.

```
((ACTOR (#ORG TYPE (*GOVT*) NAME (CONGRESS) PART (*US*) REF (DEF))
  <=> (*ATRANS*)
  OBJ (*MONEY* AMOUNT (SUFF))
  TO (#ORG INVOLVING (#WEAPON TYPE (*SUBMARINES*)
                        NAME (TRIDENT))
    REF (INDEF))
  FROM NIL)
  TIME ((AFTER NOW X))
  MODE ((INTENTIONAL)))
```

INTERPRETING EVENT FROM A US-CONSERVATIVE IDEOLOGY.

The representation above may be paraphrased as follows: An agency of the U.S. government called the Congress has the intention of transferring money (from an unspecified source) to another agency which has something to do with weapons whose category is submarines and whose name is Trident. There is a note that the amount of money transferred is sufficient for its (as yet unspecified) purpose. This last fact comes from the conceptual definition of the word 'fund.'

In order to integrate the event representation into its memory model, POLITICS must answer several crucial questions:

- (1) What agency will receive the money?
- (2) What will the money be used for?
- (3) Where did the money come from?
- (4) What is the connection between the Trident Submarines and the agency receiving the money?
- (5) What important implications (if any) does this action have on any high level U.S. goal?

There are two types of inference in the event interpretation phase of POLITICS. The first is a specification inference which resolves references in the input event representation to entities in the POLITICS world model, or creates new entities if required. The reference problem has been studied in some detail (for instance, Charniak, 1972). In the POLITICS system we do not attempt a comprehensive solution to the problem, but we have a rather intensive set of inferences to resolve references within our domain. Sometimes the reference specification includes the postulation of entities not specifically mentioned in the input, but which must exist in order for the political event to make sense. For example, the input sentence says nothing about an organization receiving the money. Specification inferences resolve the agency (postulated by the parser) to be a part of the United States Armed Forces at the highest military echelon. The U.S.-Conservative interpretation of Event (1) proceeds:

INSTANTIATING SCRIPT: \$FUNDING

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO RECEIVE (\*MONEY\* AMOUNT (SUFF))

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO BUILD (#WEAPON TYPE (\*SUBMARINES\*) NAME (TRIDENT))

The first stage in interpreting the event is the instantiation of the \$FUND script. Scripts, described in Schank and Abelson (1977) and Cullingford (1977), have two important purposes in understanding events which require access to large amounts of world knowledge. Scripts contain sequences of events describing stereotypical and/or mundane situations frequently encountered (possibly with variations) by the understander. Scripts are a mechanism for grouping inferences, as the activation of a script defines the context in which the events are to be interpreted. It is primarily the latter feature that helps POLITICS understand the



Trident submarine event. In the interpretation of Event (2), presented later in this article, the event sequence is crucial to the understanding process.

The \$FUND script is activated by the fact that the event representation produced by the parser matches the main conceptualization of the script, namely, an intended ATRANS of CONTROL of money by a top level government agency. The matching process has access to knowledge about the entites mentioned in each event. It must use this knowledge in order to decide that the Congress is at the top of the U.S. government hierarchy. The word "fund" in the input event was not part of the parsed representation; it is therefore not used to activate the \$FUND script. The following two events are also recognized as instances of the \$FUND script by POLITICS:

- (1) President Carter decided to allocate money for the jobs program.
- (2) The Senate budget provides for production of the cruise missile.

The reference specification problem for Event (1) reduces to a problem of instantiating script roles. A role in a script is a variable which appears in one or more conceptual slots in the Conceptual Dependency representation of the events depicted in the script. When a script is invoked, the roles actively "want" to be filled either by finding matching descriptions in the input event or by activating reference specification inferences which often resolve the instantiation task. (This mechanism is somewhat analogous to frame instantiation described in Charniak, 1976, and Minsky, 1975. The roles in the \$FUND script are "FUND-EE," "FUNDER," "MONEY-GIVEN," "FUND-CON" (that which is being funded), and "MONEY-NEEDED." The POLITICS \$FUND script is really the funding of large projects by a government. A more general script (more difficult to apply) could be written but would contribute little to the present domain.

The specification inference rules which are successful in resolving the FUNDER and FUND-CON roles are listed below. FUNDER is matched directly from the input event. MONEY-GIVEN and MONEY-NEEDED are not specifically resolved, but are assumed to be equal (implicit in the input).

#### SPECIFICATION INFERENCE RULES IN \$FUND

##### RULE#F3

IF X delegates (AUTHORITY, RESPONSIBILITY, or MONEY) to Y THEN Y is N levels below X in the Governmental structure  
 REFINEMENT IF <that which is delegated> is of high (MILITARY, ECONOMIC or JUDICIAL) significance  
 THEN probably N = 1.

##### RULE#F5

IF the GOAL of the funding is of a MILITARY nature  
 THEN expect a MILITARY agency to receive the AUTHORITY to spend the money (i.e. CONTROL of the money).

(APPLYING RULE#F3 FROM \$FUND)

INFERENCE: (#GOV-ORG PART (\*US\*) RANK (LEV VAL (1))) TO RECEIVE (\*MONEY\* AMOUNT (SUFF))

SPECIFIED: &FUNDEE = (#GOV-ORG PART (\*US\*) RANK (LEV VAL (1)))

(APPLYING RULE#F5 FROM \$FUND)

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO RECEIVE  
(\*MONEY\* AMOUNT (SUFF))

SPECIFIED: &FUNDEE = (#ARMEDFORCES PART (\*US\*) RANK (COMMAND))

RULE#F6

IF &FUND-CON involves promoting X (e.g. helping bring X into existence)  
AND &FUNDER does not already have X  
AND &MONEY-GIVEN is greater than or = &MONEY-NEEDED  
THEN expect &FUNDEE to do the necessary actions to bring X about.

(APPLYING RULE#F6 FROM \$FUND)

SPECIFIED: &FUND-CON =

((CON ((ACTOR (\*MONEY\* AMOUNT (SUFF)) IS (CONTROL VAL  
(#ARMEDFORCES PART (\*US\*) RANK (COMMAND)))))

ENABLE

((ACTOR (# ARMEDFORCES PART (\*US\*) RANK (COMMAND))  
<=> (\*DO\*))

RESULT

((ACTOR (#WEAPON TYPE (\*SUBMARINES\*) NAME (TRIDENT))  
IS (CONTROL VAL-  
(# ARMEDFORCES PART (\*USA\*) RANK (COMMAND))))) )

RULE#F8

IF X (X same as in RULE#6) has a physical realization  
AND &FUNDEE controls the creation of X  
THEN &FUND-CON = (&FUNDEE will build X).

(APPLYING RULE FROM \$FUND)

INFERENCE: (#ARMEDFORCES PART (\*US\*) RANK (COMMAND)) TO BUILD (#  
WEAPON TYPE (\*SUBMARINES\*) NAME (TRIDENT))

SPECIFIED: &FUND-CON =

((ACTOR (#ARMEDFORCES PART (\*US\*) RANK (COMMAND))  
<=> (\$CONSTRUCT ENABLEMENT: (\*MONEY\* AMOUNT (SUFF)) POBJ:  
(#WEAPON TYPE (\*SUBMARINES\*) NAME (TRIDENT)) )  
MODE ((INTENTIONAL)))

The Specification inference process is often one of progressive refinement, as in the above examples, with the purpose of making each referent as well specified as possible. There are some rules which are context independent, but the majority are context sensitive; they are invoked only in the scope of an activated script. In this respect POLITICS differs from other rule-based systems such as MYCIN (Shortliffe, 1976).

The concept of FUNDING includes one other crucial aspect: The money is given with the intention that the FUNDEE will fulfill the purpose which the FUNDER had in mind. This purpose is usually well defined in terms of our full world knowledge, but it is poorly defined in terms of the linguistic realization of most events. For instance, in the Trident event there was no mention of building the submarines (the FUNDEE's goal) or what Congress may want the submarines for (the FUNDER's goal). The former goal was specified by means of applying

inferences grouped in the funding script. The latter goal is of a much more global nature. The FUNDING script is only instrumental in fulfilling Congress's goal; it says *how* Congress intends to make the Trident submarines come into existence, not *why* Congress chose to do so.

### GOAL-DIRECTED INFERENCING

The second phase of interpreting an event consists of attributing goals to the political entities. The goal-directed inference process strives to determine which goal each political actor is trying to achieve. Which goal-directed inferences are triggered is highly dependent on the ideology assumed by the interpreter. The input events are assumed to be instrumental to the achievement of one or more goals attributed to the respective political actors. In addition the context of a newly activated script and any specification inferences that have been made are considered in terms of achieving some goal present in the actor's ideology. In other words, the goal directed inferences determine what was the "real meaning" of a political event from a given ideological viewpoint. Consider some specific rules which were invoked in the continuing U.S.-Conservative interpretation of the Trident event:

#### RULE#4

IF a new weapon system is built by some agency of the armed forces of country X  
 THEN the military power of X will increase  
 REFINEMENT: INVOKE(RULE#4.1 RULE#4.2 Rule#4.3)

#### RULE#4.1

IF increase in military power is a high level goal of X  
 THEN expect X to do any scripts enabled by the increase in power which do not violate other goals of X.

#### RULE#4.2

IF increase in military power is a low level goal of X  
 THEN expect X to be working on some goal for which military strength is a precondition.

#### RULE#5

IF Country X Achieves increase in military power  
 THEN look for country Y such that either Y is in open hostility to X, or Y poses a threat to X.

(APPLYING RULE#4 FROM GOAL-DETERMINATION)

INFERENCE: \*US\* INCREASE IN MILITARY POWER

ACTIVATE: (\$CONFRONTATION)

(APPLYING RULE#5 FROM GOAL-DETERMINATION)

(PENDING DEMON (SEARCH THREAT \*US\*))

In interpreting the present event from a U.S.-Conservative ideology the high level goal of achieving military strength (in the U.S. goal tree) is easily matched with the result of RULE 4, hence the reason for the U.S. Congress vote to fund the Trident project is established. The same event interpreted with a U.S.-liberal goal tree attributed to the U.S. runs into a little more difficulty. The same

inference (RULE 4) is triggered, but its result does not match any goal in the tree. The inference monitor then searches scriptal goals to see why the U.S. could possibly want more weapons. This search finds the arms race script where the goal of each participant is to increase their respective military power. Hence, the liberal and conservative interpretations diverge at this point of the understanding phase. Let us continue with the U.S.-Conservative interpretation:

INFERENCE: GOAL OF \*US\* IS (#COUNTRY TYPE (\*COMMUNIST\*) SIZE (LARGE)) TO FEAR \*US\*

INSTANTIATING SCRIPT: \$CONFRONTATION

INFERENCE: (#COUNTRY TYPE (\*COMMUNIST) SIZE (LARGE)) TO STOP EXPANDING POLITICAL-CONTROL

INTERPRETATION COMPLETED, READY TO ACCEPT QUESTIONS.

The first of the above inferences is generated not by a specific rule but by a new prototypical process called counterplanning, whose rules are more general than the scriptal inference rules which deal with mundane reality. The process of counterplanning, which is outlined in a later section, is a cognitive process that has not been previously investigated in Artificial Intelligence to our knowledge. The question which POLITICS asks itself is "Why did the U.S. have the goal of increased military strength?". If the U.S. was involved in an armed conflict (such as war) then the question would immediately be answered. In the present interpretation, however, POLITICS must expand and interconnect the ideological goal trees of the United States and any country posing a military threat to it. As POLITICS searches for a possible threat to the U.S. it finds only the top level goal of the Soviet Union, namely, domination of the entire world. (POLITICS queries its memory to discover that the U.S. is part of the world, therefore subject to the intended Soviet domination.)

Discovering that Russia is a threat to the U.S., POLITICS applies its counterplanning model (Rule C1 in the Counterplanning section is triggered) to conclude that Russian military superiority is a precondition (i.e., necessary subgoal) to Russian expansion, which is in turn a precondition to Russian world domination. Therefore, a good U.S. counterplanning strategy is to block Russia from achieving military superiority. This is done by the U.S. achieving military superiority (a goal which is mutually exclusive with Russian superiority), thereby preventing Russia from achieving its higher goal and ending the threat to the U.S. (The inferencer actually constructs the above chain of reasoning for large Communist nations, including China and Russia.)

The military confrontation script is partially instantiated as a possible future scenario, where Russia would back down as a result of its military inferiority. Thus, the interpretation of Event (1) fulfills the goals of a (rather naive) U.S.-Conservative ideology.

The question-answering module implemented for POLITICS includes many of the question analysis strategies in the SAM system (Lehnert, 1977), plus more

detailed context updating, and a mechanism for calling upon the inferencer when the memory search strategies fail.

The first two questions answered by POLITICS reflect the inferencing described above. The third question requires further counterplanning:

(1.1)

Q: What did the U.S. Congress do this for?

A: THE UNITED STATES CONGRESS WANTS THE UNITED STATES ARMED FORCES TO BE STRONGER.

(1.2)

Q: Why should the U.S. be stronger?

A: THE UNITED STATES ARMED FORCES SHOULD BE STRONG TO STOP COMMUNIST EXPANSION.

(1.3)

Q: What should the U.S. do if Russia builds nuclear submarines?

A: THE UNITED STATES SHOULD BUILD MORE SUBMARINES.

Russia building nuclear submarines is interpreted to mean a Russian bid for military superiority, since this Russian goal had been activated in the event interpretation phase. The counterplanning model recognizes the military buildup as a response to the original U.S. buildup by once again using Rule C1 of thwarting an opponent's goal by achieving a mutually exclusive one. The proposed answer is the same one we encountered before, namely, to have the U.S. invoke Rule C1 a second time, implying yet more weapons should be built. Hence, we see the application of a rather simple rule to a rather complex situation (including assumptions about other country's intentions) yielding a Cold-War response.

U.S.-Liberal interpretation of the Trident event proceeds in exactly the same manner as the Conservative one through the reference specification phase. The subsequent goal directed inferences differ in that POLITICS fails to recognize the buildup of military power as a United States goal. Instead, the scriptal arms race goal is matched. The goal of the other country (the arms race script knows it to be a large communist country) is also known to be building up its military resources. A crucial difference in the interpretation up to this point is that these scriptal goals are NOT connected to any high level goals in the U.S.-Liberal goal trees of either country. Therefore, U.S.-Liberal POLITICS does not see any justification for the scriptal arms race goals being present. Finally, in the search to try to connect the arms buildup to any goals, POLITICS finds that there is indeed a conflict between what it thinks are the highest level \*US\* and Communist goals (both being world peace) and a potential armed conflict. (Arms buildup is a precondition to armed conflict, therefore undesirable.)

(1)

Q: What did the U.S. Congress do this for?

A: THE UNITED STATES CONGRESS FEARED FALLING BEHIND IN THE ARMS RACE.

(2)

Q: What will Russia do next?

A: RUSSIA WILL PROBABLY BUILD MORE WEAPONS.

(3)

Q: What should the U.S. do if Russia builds Submarines?

A: THE UNITED STATES SHOULD NEGOTIATE WITH RUSSIA TO STOP THE ARMS RACE.

The response to the first question reflects the goal induced into the \*US\* goal hierarchy by the \$ARMSRACE script. The method of forcing a country (or any other entity) to assume a new goal is closely related to the idea of rationalization. The only way to explain why the \*US\* would be involved in the arms race is to say that the \*US\* might NOT have wanted one of the possible consequences of avoiding the arms race. Both consequences are stored in the script. The second consequence was that neither side would have more arms. This consequence is an indirect subgoal to world peace; hence, negating it would contradict the known U.S. goal of world peace. Thus, POLITICS concludes that (for some unexplained reason) the U.S. must have had the goal of avoiding the former consequence.

The answer to the second question comes directly from the event sequence of the arms race script.

The third question cannot be answered from the script; it invokes the counterplanning module. POLITICS knows that there is a goal conflict between the highest level goals of Russia and the U.S. and the arms race scriptal goals. This situation matches the test clause of Rule C6 (given in the following section); hence, the response is an instantiation of its respective action clause.

## GOAL CONFLICTS AND THE COUNTERPLANNING MODULE

In the course of forming an event representation and formulating ideologically based predictions, one needs a mechanism for understanding the conflicts between the goals of one or more political actors. Inferring what the goals are and applying scripts for the more stereotyped goal interactions and conflicts only solves a part of the problem. The process of deciding what course of action to take in order to achieve an active set of goals is usually called planning. There is substantial work described in the AI literature on the problem solving aspect of planning. Schank and Abelson (1977), Wilensky (1978), Schmidt and Sridharan (1977), and Bruce (1975) have studied planning from a story understanding perspective in a social context. For the POLITICS project we investigated the idea of counterplanning, i.e., how to thwart an adversary's plans, or how to recover from stumbling blocks put by the adversary in the path of an actor's plans.

Counterplanning consists of a set of strategies that determine why, where, and when to apply the appropriate counterplanning methods or rules. These strategies analyze the active goal conflicts or plans being blocked in order to ascertain why the conflict situation came about, and what courses of action each conflicting party can take to further its own interests.

There are counterplanning strategies to determine how to best block an actor from achieving its goal(s), and strategies to determine how to try to achieve one's goals in spite of intentional interference from other actors. For each strategy in the former category there exists a "dual" strategy in the latter category. The counterplanning strategies currently implemented in POLITICS are listed below:

General strategies for an actor A preventing actor X from achieving its goal  $G(X)$ :

1. Discover what plan X is pursuing in order to achieve  $G(X)$ .
2. Failing (1), decide what plan A would use if it was in X's situation. Expect X to pursue such plan.
3. Discover the weakest, most easily blocked link in the plan.
4. Apply one of the counterplanning rules (listed below) to block the plan at its weakest link.
5. Expect X to modify his plan to bypass the blocked link or to formulate a new plan.
6. Block the new or modified plan.
7. If  $G(X)$  is very high priority, then expect X to pursue more than one plan simultaneously to achieve  $G(X)$ . Block all plans.
8. If at any point the cost of blocking  $G(X)$  exceeds the cost associated with X achieving  $G(X)$ , abandon the counterplanning.

General strategies for an actor A to achieve its goal  $G(A)$  in spite of active intentional interference from X:

1. Apply normal planning strategy to find a plan to achieve  $G(A)$ .
2. If X blocks the plan, find an alternative plan or:
  - (a) Bypass the blocked link (by modifying A's plan).
  - (b) Block some goal X is trying to achieve, and bargain to mutually stop blocking each other's plans.
  - (c) (Temporarily) abandon  $G(A)$  until X is no longer blocking a vital link.
3. If  $G(A)$  is of high importance to A, pursue multiple plans simultaneously to achieve  $G(A)$ .
4. If  $G(A)$  is a subgoal to a higher level goal  $G'(A)$ , find a new plan for  $G'(A)$  which does not require achieving  $G(A)$ .
5. Keep one's plans secret from X or anybody who may communicate them to X.
6. If X needs to achieve some  $G(X)$  in order to block a link in A's plan for  $G(A)$ , then simultaneously block X's plan for  $G(X)$  while pursuing  $G(A)$ .

POLITICS realizes that there are many actors in the political world, some of which may have active conflicting goals. We define a set of goals to be in conflict if they are mutually exclusive, that is, the achievement of one goal in the set precludes any other goal from being achieved. For instance, the case where many factions are striving for political control of a country represents a case of mutual goal exclusion (barring possible coalitions). The mutual exclusion principle gives the first two counterplanning rules (where A is the active counterplanner):

- RULE C1: To stop actor X from accomplishing his goal  $G(X)$  see if there is any goal  $G(A)$  which is mutually exclusive with  $G(X)$ . If so, give high priority to accomplishing  $G(A)$ .
- RULE C2: If A wishes to accomplish  $G(A)$  and  $G(A)$  is being blocked by X working on a mutually exclusive  $G(X)$  then try to thwart  $G(X)$  by some other means.

Counterplanning rules are applied both in the event interpretation phase, and at question-answering time when POLITICS is asked questions of the type: "What should the U.S. do about X?" or "How might Russia respond if the U.S. did Y" (where Y may be some hypothetical plan to thwart Russia's X). The best examples of counterplanning are in the conservative and liberal interpretations of Event (1) in the first section. The implemented counterplanning rules are little more than functionally encoded commonsense knowledge. As such, they are more general than many of the goal inferences and particular scripts of the POLITICS world. There are probably detailed counterplanning rules specific to the world of international politics, but we deemed it more productive to investigate the more general rules. These commonsense rules are shared by different ideologies, but their application (triggered by active goals) differs depending on the interpretation of the event and inferred motives of the actors. There is no claim of completeness for the implemented counterplanning rules. A few other rules were considered but not implemented. The following are the four other counterplanning rules present in the POLITICS system at this time:

- RULE C3: To prevent X from achieving  $G(X)$  threaten a higher level goal of X, say  $G'(X)$ . Thus, expect X to divert its efforts to  $G'(X)$ .
- RULE C4: To prevent X from achieving  $G(X)$  prevent X from achieving a necessary subgoal of  $G(X)$ .
- RULE C5: To achieve  $G(A)$  if X is blocking a subgoal of  $G(A)$  try to find an alternative plan (or script) for  $G(A)$ .
- RULE C6: If  $G(A)$  and  $G(X)$  are in conflict and there exists a  $G'(A) = G'(X)$  where the  $G'$  goal is higher level than the  $G$  goals, then A should try mediating with X to mutually achieve  $G'$  and abandon their respec-



time G goals. (Metaphorically speaking: Why fight over a molehill when together we can conquer a mountain.)

*Interpretation of Event (2)*

(INTERPRET US-CONSERVATIVE)

INPUT TEXT: Russia massed troops on the Czech border.

INTERPRETATION COMPLETED, READY TO ACCEPT QUESTIONS.

Q: Why did Russia do this?

A: BECAUSE RUSSIA THOUGHT THAT IT COULD TAKE POLITICAL CONTROL OF CZECHOSLOVAKIA BY SENDING TROOPS.

Q: What will Russia do next?

A: RUSSIA MAY TELL ITS TROOPS TO START THE INVASION.

Q: What else can Russia do?

A: RUSSIA MAY WAIT FOR CZECHOSLOVAKIA TO GIVE IN TO RUSSIAN DEMANDS.

Q: What happens if Czechoslovakia does not give in?

A: RUSSIA MAY DECIDE TO START THE INVASION.

Q: What should the United States do?

A: THE UNITED STATES SHOULD INTERVENE MILITARILY.

Q: What else can the United States do?

A: THE UNITED STATES CAN DO NOTHING, OR IT CAN INTERVENE DIPLOMATICALLY BY CONFERRING WITH RUSSIA ABOUT CZECHOSLOVAKIA. THESE ALTERNATIVES ARE BAD FOR THE UNITED STATES.

One method of understanding an event is to recognize that the event is a specific instance of a more general sequence of actions which the understander knows about from previous experience. The interpretation of Event (2) illustrates the usefulness of the sequence of actions and goals which may be encountered with slight variations many times in the course of understanding stories. For instance, Fig. 2a is the prototypical INVADE script which POLITICS uses to understand Event (2). Figure 2b is the instantiated script, after interpreting the Czechoslovakia event, with instantiated script roles, dynamically selected "default" path, and (in one instance, i.e., the border) a scriptal concept substituted by a functionally equivalent concept in the input event. The scripts are internally represented in full detail in (Schank, 1972). For the sake of readability, Fig. 2 has been simplified and diagramed. An "&" preceding a word denotes an uninstantiated script role analogous to a slot in a frame (Minsky, 1975). Angular brackets indicate that an English phrase has been substituted for the actual representation when the latter is not of primary interest.

As exemplified in Fig. 2a, most scripts have many branching sequences of events which may rejoin each other at a later point in the temporal sequence. These parallel sequences are called *tracks*. In the instantiation of a script only one track is instantiated, the track describing the sequence of events in the story.

ROLES: &INVADER (ISA . \*COUNTRY\*)  
 &INVADEE (ISA . \*COUNTRY\*)  
 &FORCES1 (ISA . \*ARMEDFORCES\*)  
 (PARTOF . &INVADER)  
 &FORCES2 (ISA . \*ARMEDFORCES\*)  
 (PART OF . &INVADEE)  
 &KEYPLACES (PARTOF . &INVADEE)  
 (FUNCTION <political control of  
 &INVADEE>)

GOALS: <goal of &INVADER is to take political control of &INVADEE.>  
 <goals of &INVADEE is to prevent &INVADER from taking political control of  
 &INVADEE.>

BODY OF \$INVADE (Causally connected sequence of actions.)

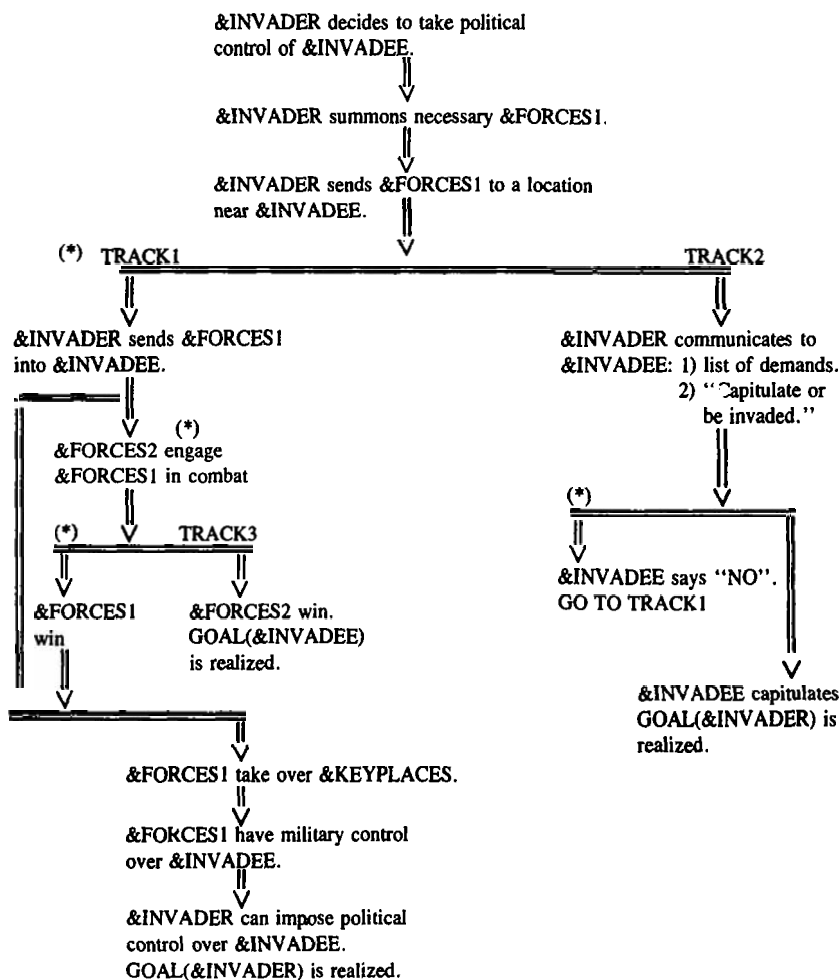


FIG. 2.(a) Uninstantiated invade script in the POLITICS system. Starred (\*) tracks signify the default path in the U.S.-conservative ideology.

## INSTANTIATED SCRIPT ROLES:

&INVADER ← \*RUSSIA\*  
 &INVADEE ← \*CZECHOSLOVAKIA\*  
 &FORCES1 ← (\*TROOPS\* PARTOF (\*RUSSIA\*))  
 &FORCES2 (uninstantiated)  
 &KEYPLACES (uninstantiated)

## INSTANTIATED GOALS:

GOAL OF RUSSIA: (Take political control of  
 Czechoslovakia.)  
 SUBGOAL: (Take military control of  
 key places in Czechoslovakia.)  
 GOAL OF CZECHOSLOVAKIA: (Prevent Russia from  
 taking political control.)  
 SUBGOAL: (Prevent Russia forces from taking  
 military control of key places.)

## INSTANTIATED PATH IN SCRIPT:

\*RUSSIA\* decides to take political  
 control of \*CZECHOSLOVAKIA\*



\*RUSSIA\* summons necessary TROOPS.



\*RUSSIA\* sends TROOPS to the border  
 between \*RUSSIA\* and \*CZECHOSLOVAKIA\*.



(Present point in the story time-line)  
 What follows is the default path in  
 the US-conservative ideology.



\*RUSSIA\* sends TROOPS into \*CZECHOSLOVAKIA\*.



Russian TROOPS defeat Czech TROOPS in combat.



Russian TROOPS take over Czech &KEYPLACES.



Russian TROOPS have military control over  
 \*CZECHOSLOVAKIA\*.



\*RUSSIA\* can impose political control over  
 \*CZECHOSLOVAKIA\*, achieving its goal.

FIG. 2.(b) Instantiated invade script, initial segment followed by the predicted default path.

of the previously described reference specification inferences grouped under each. When the story is incomplete, as in Story (2), there are usually more than one possible uninstantiated tracks in the script which may describe future sequences of events. One of these tracks, labeled the default path, is judged to be the most likely one to take place. The default path is inferred for predicting future events unless there is evidence supporting some other track or evidence indicating that the script should be aborted. The default path is dynamically chosen depending on the point of view of the interpreter. For instance, in the U.S.-Conservative ideology it is assumed that Russia's main goal is world domination at all costs, therefore the direct invasion track is chosen to be the default path. The U.S.-Liberal ideology assumes that Russia's main goal is to avoid a nuclear war; expanding its political control is considered to be a lesser goal. Hence, the U.S.-Liberal ideology chooses the threat branch for its default path.

Consider the different aspects of the implementation of a script application system for a new task domain. The idea of scripts comes from Schank and Abelson (1977). The first working system applying scripts was SAM, implemented primarily by Cullingford (1977). SAM applied scripts mostly to understanding "routine" newspaper stories such as automobile accidents and visiting dignitaries. POLITICS is the second system to implement scripts, although script application is only one of many processes in the system. The use of scripts in POLITICS is not just to understand what happened, but also to set up a predictive framework to direct inferences, invoke ideologies, and resolve goal conflicts via counterplanning strategies. Thus, our scripts need to have more than branching sequences of events to be matched to input stories. We associate goals with scripts (as illustrated above), and we associate subgoals with each branching sequence of events. The script applier, once it decides to invoke a script, must: (1) Match the events in the input with the event chains in the script. (2) Instantiate the script roles according to matches with the input event or with the results script. (3) If concepts in the input do not match the script, then substitute the actual events for their functionally equivalent (fulfilling the same subgoal) events in the instantiated script. (4) Choose the default path whose goals best match the ideologically predicted goals for the instantiated actors. (5) Update the entries in the world model to incorporate new facts, if any, contained in the input.

The script selection process in the present interpretation is not as simple as in the interpretation of Event (1). For example, there is a script application heuristic that states that a script should be invoked if its primary conceptualization matches the input event. This heuristic fails to recognize \$INVADE, as Event (2) matches only a precondition fulfillment conceptualization in \$INVADE. The problem is resolved by a bootstrapping process of the goal-directed inferencer and the script applier working in conjunction. The establishment of a concentration of force is a subgoal to many possible Russian goals; therefore the inferencer calls upon the applier to determine which courses of action are applicable. The script applier generates two alternatives from the event depicted in the input story augmented

by the two previous inferences: Russia may want to invade Czechoslovakia, or Russia may want to militarily aid Czechoslovakia. These two scripts are the only two which have as a prerequisite the concentration of military force in the vicinity of a small country. The inferencer is called again for a goal-directed determination of which (if either) of these courses of action may fulfill Russian goals. By interrogating the world model, the inferencer determines that since Czechoslovakia is not involved in any military conflict nothing can be achieved by sending troops to its aid. On the other hand, one of Russia's goals, stronger political control over small nations, may be achieved as a result of an invasion. The script applier is called a second time to invoke the invasion script whose first scene involves the transfer of a sizable military force near the object of the contemplated invasion.

The particular goal-directed inference rule invoked to determine the correct script is:

Let X be a small country, Y be a large country.

**RULE#13**

(TRIGGER: Y moves troops near to or inside of X)

IF X is involved in a military conflict and needs assistance

AND having X win the conflict helps Y achieve one of its goals

THEN Y will have the goal of military aiding X.

ELSE IF Y has expanded its political control as a high level goal

THEN Y has the goal of military takeover of X.

This rule is somewhat more complicated than those previously encountered in two ways: First, the rule is only activated for possible consideration in the case that the trigger matches a part of the representation of the input event. Thus this rule is context sensitive in a similar way to the context dependent reference specification rules activated by an invoked script. Second, the rule contains an ELSE clause and an embedded conditional; this relaxation of constraints in rule format is useful only on pragmatic grounds. The above rule is not as specific as it may appear to be. For instance, the rule, also under the U.S.-Conservative ideology, will decide that the reason the United States sent troops to South Vietnam was to aid the South Vietnamese. (South Vietnam was in an armed conflict, needing assistance, and defeating a communist faction is a U.S. goal.)

## DOCUMENTED EVENT INTERPRETATION AND PROTOCOL

There are some other aspects to the POLITICS system which are necessary for a successful implementation. The interpretation of the third event illustrates a rudimentary form of learning about new entities in the world and some question answering strategies.

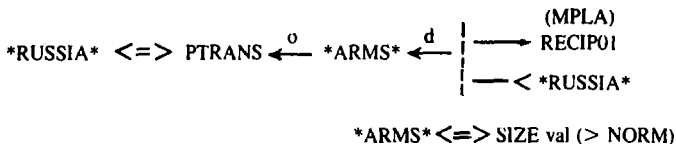
### *U.S.-Conservative Interpretation of Event (3)*

\*(INTERPRET U.S.-CONSERVATIVE)

INPUT TEXT: Russia sends massive arms shipments to the MPLA in Angola.

PARSING...(UNKNOWN WORD: MPLA)  
 (SYNTACTIC EXPECTATION: NOUN)  
 (SEMANTIC EXPECTATION: (FRAME: (ATRANS PTRANS) SLOT: RECIP REQ: (LOC ACTOR)))  
 COMPLETED.

The parser tries to parse the input text into Conceptual Dependency representation. Upon encountering "MPLA," a word that it does not recognize, the parser fills the slot in the Conceptual Dependency parse with a token of unknown identity which has to fulfill the parser expectations. That is, the unknown entity has to be a noun which is either a location or an actor, and has to fit in the recipient slot of an ATRANS or PTRANS framework. Hence, the parse looks as follows:



As the event interpretation continues, a memory entry is created for RECIP01 when the specification inferences using the parser expectations and information about the world decide that the MPLA is probably a communist political faction of Angola. More specifically, the system knows that Angola is in a state of civil war, infers that sending arms is an instance of giving military aid, and knows that Russia is communist. Using this knowledge, and the inference rules discussed in the previous section POLITICS is able to create a memory entry for the MPLA. This information is used in the script application and question-answering phases of the protocol. One can view the automated creation of new memory entries and the addition of information to existing entries as a form of rudimentary learning. This aspect of the system was developed independently on pragmatic grounds, but Granger (1977) has a similar method for figuring out the meanings of words from context in the SAM system.

#### INTERPRETING EVENT FROM A US-CONSERVATIVE IDEOLOGY

INFERENCE: \*MPLA\* MAY BE A POLITICAL FACTION OF \*ANGOLA\*  
 INFERENCE: \*RUSSIA\* ATRANS \*ARMS\* TO \*MPLA\*  
 INFERENCE: \*MPLA\* IS PROBABLY \*COMMUNIST\*  
 INFERENCE: GOAL OF \*MPLA\* IS TO TAKE OVER \*ANGOLA\*  
 INSTANTIATING SCRIPT: \$AIDMF  
 INFERENCE: \*RUSSIA\* MAY WANT TO CONTROL \*ANGOLA\* THROUGH \*MPLA\*

INTERPRETATION COMPLETED, READY TO ACCEPT QUESTIONS.

Two goal-directed inferences determined that the MPLA wants to take control of ANGOLA, and that Russia is using the MPLA for its own ends: gaining political control of a small country. The goal of political factions in general is to

take political control of countries. (Recall that we are under the U.S.-Conservative ideology.) The MPLA is probably a political faction. Having weapons is a precondition for military takeover. Military takeover leads to political control. Ergo, the MPLA has the active goal of taking over Angola. The inference pertaining to Russia's goal comes from the instantiation of the military aid script (\$AIDMF) which says that the reason why one country aids another is that the first country expects something in return (i.e., the fulfillment of one of its own goals). Under the conservative ideology, the only Russian goal that the MPLA can fulfill is to give Russia a measure of political control over Angola.

The question-answer dialogue for Event (3) follows.

(1)

Q: Why did Russia do this?

QUESTION TYPE IS: WHY  
SEARCHING INFERENCES..

A: RUSSIA WANTS TO CONTROL ANGOLA THROUGH THE MPLA.

(2)

Q: What will the MPLA use the arms shipments for?

QUESTION TYPE IS: WFR  
SEARCHING GOLDWATER IDEOLOGY  
SEARCH FAILURE...TRY AGAIN DECISION  
SEARCHING SCRIPT: \$AIDMF

A: THE MPLA WANTS TO TAKE OVER ANGOLA USING THE WEAPONS.

The above two questions illustrate the results of the previously discussed goal-directed inferencing. Each question is analyzed into a question type indicating the type of information desired by the person posing the question. (See Lehnert, 1977, for a full elaboration on the theory of question answering.) Then the answering module either searches the appropriate section of memory for the answer, or calls upon the inferencer (hence the script applier which is called by the inferencer) for further computation. The search for an answer is heuristically guided. On failing to find the answer on the first try POLITICS chooses an alternative search or computation if it is deemed that the desired information may be plausibly found by such alternate means. The questions and answers presented below illustrate information retrieval from the military aid script and further inferencing to predict possible future actions. For instance, the system knows that in a civil war there is more than one faction in military conflict, each faction with the goal of political control of the country. Hence, the same general course of action is predicted for other hypothetical factions, namely that of seeking military aid. In the U.S.-Conservative ideology the United States is always ready to oppose communist expansion, therefore it would satisfy both the goals of the United States and the goals of the factions opposed to the MPLA if the United States were to send arms to the aforementioned factions.

(3)

Q: What will the other factions in Angola do?

A: THE OTHER FACTIONS MAY ASK SOME OTHER COUNTRY FOR ARMS.

(4)

Q: Which country?

ATTEMPTING FURTHER SPECIFICATION OF \*COUNTRY\* IN CURRENT CONTEXT.

A: PROBABLY THE UNITED STATES.

(5)

Q: Should the United States do anything about it?

A: YES, THE UNITED STATES SHOULD SEND ARMS TO THE OTHER FACTIONS IN ANGOLA.

Two entries in the world model before the interpretation of Event (2):

	ENTRY	INFORMATION
(1)	*MPLA*	NIL
(2)	*RUSSIA*	((ISA . *COUNTRY*) (GOVERNMENT . *COMMUNIST*) (SIZE . *LARGE*) (PROX *CZECHOSLOVAKIA* *CHINA*) (CAPITAL . *MOSCOW*) (LEADER . *BREZHNEV*)) <No currently active goals>

Same entries after the interpretation of Event (2):

	ENTRY	INFORMATION
(1)	*MPLA*	((ISA . *FACTION*) (IDEOLOGY . *COMMUNIST*) (PAROF . *ANGOLA*) (GOALS: ((ACTOR (*MPLA*) IS (*SCONT* OBJECT (*ANGOLA*) VAL (10))))))
(2)	*RUSSIA*	((ISA . *COUNTRY*) (GOVERNMENT . *COMMUNIST*) (SIZE . *LARGE*) (PROX *CZECHOSLOVAKIA* *CHINA*) (CAPITAL . *MOSCOW*) (LEADER . *BREZHNEV*) (GOALS: ((ACTOR (*RUSSIA*) IS (*SCONT* OBJECT &COUNTRY VAL &MAXNUM))) ((ACTOR (*RUSSIA*) IS (*SCONT* OBJECT (*ANGOLA*) VAL (8)) INST ((ACTOR (*MPLA*) IS (*SCONT* OBJECT (*ANGOLA*) VAL (10)) ))))))

<Active goals only>

This event illustrates a case where the major part of the interpretation and question-answering phases were accomplished through the inferencing mechanism rather than through script application. The interpretation of Stories (1) and (2) rely more heavily on the script(s) involved. Comparing the memory



entries for Russia and the MPLA before and after processing Event (3) illustrates the previously mentioned acquisition of information from surrounding context.

### CONCLUDING REMARKS

The contributions of the POLITICS system to AI research are the following: (1) Development of a representation for political ideologies which is independent of the reasoning processes themselves (e.g., the inference rules). (2) Further development of context dependent inference rules, applied to a completely new domain. (3) Modeling counterplanning strategies at the level of intentional goal conflicts and mutual exclusions. (4) The successful implementation of scripts in a class of knowledge domains for which they were not originally designed when formulated as part of Schank and Abelson's theory of predictive understanding. (5) The attachment of reference specification rules to scripts, thus making scripts more effective in defining a context in which to interpret events.

Recent work on POLITICS extends the input which the system can handle from a single event to stories comprising a sequence of events. Some new problems have arisen which indicate that some general mechanism is needed to determine political (or social) power relations between the actors in the political world. For instance, under the U.S.-Liberal ideology, the Czechoslovakia event was given some follow-up events after interpretation and question answering. The dialogue follows:

Input: The Russians massed troops on the Czech border.

Q: What should the U.S. do?

A: THE US SHOULD DENOUNCE THE RUSSIAN ACTION TO THE UN.

Input: The U.S. denounces the Russian threat to the UN. Russia rejects U.S. criticism. The UN resolves to condemn the Russian action. Russian troops move into Czechoslovakia.

Q: What should the U.S. do now?

A: THE US SHOULD APPEAL TO RUSSIA TO STOP THEIR INVASION.

The problem with the above dialogue is twofold. One does not appeal to someone whom one has just denounced. If a higher authority (the UN) fails to stop an invasion by diplomatic means, then it is extremely unlikely that the same diplomatic means would work if applied directly by a lower diplomatic authority (the U.S.). The POLITICS system needs a concept of political power relations between all political entities to determine which courses of action are appropriate, what to do in case of failure, and how to represent and reference the nature of the relation between any two political entities. We are currently working on some possible solutions to these and other related problems.

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