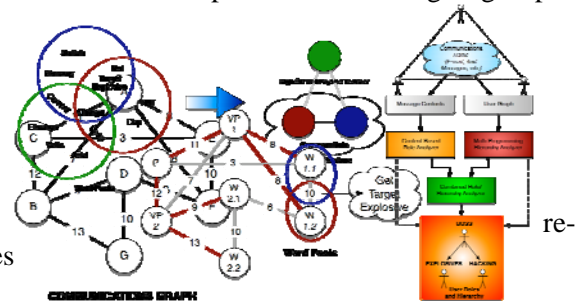# Automatic Role Inference from E-mail Loquacity (ARIEL)

Project Overview

ARIEL is a proposed knowledge mining program for the Department of Homeland Security. The program begins with the assumption that DHS agents can successfully tap lines of electronic communication within a group of interest (i.e., monitor the e-mail or text messaging of a group with the borders of the United States). The ARIEL program has four main goals:

- ☐ Using message externals, identify likely hierarchies within the group.
- ☐ Determine key words or phrases within the messages passed by the group.
- ☐ Automatically identify and assign roles to individuals within the group based on observed message internals.
- ☐ Combine message externals and message internals to form a complete understanding of group role and hierarchy dynamics.

We approach these objectives using a combination of modern computational linguistics and a specially designed network programming problem to identify both role and hierarchy simultaneously. We then use this information to re- optimize the assignment of roles and responsibilities using a mixed role/communications mathematical programming formulation.

Key ARIEL technical accomplishments to date:

- ☐ Developed key word detection software for use in e-mail analysis.
- ☐ Developed network programming model of hierarchies as described by communications patterns.
- ☐ Developed a novel mathematical programming method for integrating Jacaard Index measures of role similarity with message flow analysis
- ☐ Developing text analysis tools and integrating with OTS math programming solvers.

Benefits

Intelligence and Homeland Security Analysts are constantly monitoring digital communications channels. These tools will enhance their ability to distill critical knowledge from message internals and externals.

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