AFRL-OSR-VA-TR-2014-0337

CASE-BASED INFLUENCE IN CONFLICT MANAGEMENT

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10/31/2014
Final Report

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
30/09/2014	Final	15/09/2010 - 14/09/2014

4. TITLE AND SUBTITLE
Case-based Influence in Conflict Management

5a. CONTRACT NUMBER
FA9550-10-1-0373

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
USAF, AFRL
AF Office of Scientific Research
875 N. Randolph St., Room 3112
Arlington, VA 22203

10. SPONSOR/MONITOR'S ACRONYM(S)
USAF, AFRL

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Distribution A- approved for public release

13. SUPPLEMENTARY NOTES
None

14. ABSTRACT
The project proceeded in three phases. The first phase analyzed how historical analogies are used to make sense of novel events, comparing historical analogies invoked in three events in newspapers from five countries. Case-based reasoning was found to be very common, with almost one historical analogy per article (963/1061). The second phase of this project was inspired by a desire of CyberCom to study how historical analogies might be relevant to cyber conflict. The result was a case-by-case analysis of 35 different analogies with the lessons for the understanding of potential cyber conflict. Analogies such as these can serve several purposes: to motivate (by fear or inspiration), to demonstrate what is possible, to provide examples from the past of things to avoid, and to illuminate particular features of past events that might be worth thinking about in preparation for cyber conflict. The third phase of the project was motivated by the fact that it took 15 years, from 1945 to 1960, to understand the strategic implications of nuclear technology. The goal was to help avoid a similar delay in understanding the strategic implications of cyber technology. The result was a mathematical model for the strategic analysis of the timing of cyber conflict that quickly received attention from over 30 countries.

15. SUBJECT TERMS
cyber conflict, case-based reasoning, case-based influence

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Richard D. Davis
U	U	U	UU	3	19b. TELEPHONE NUMBER *(Include area code)* 480-221-6120

Axelrod, Final Report and Publications

Final Report

The first phase of this project analyzed how historical analogies are used in the media to make sense of novel events. This work was done by the PI and his post-doctorial fellow, Larissa Forster. While earlier work by others focused on single case studies, this study was the first quantitative analysis comparing historical analogies invoked in three events in newspapers from five countries (Axelrod and Forster, 2012). With very high intercoder reliability we found 881 invocations of historical analogies, almost one per article. We found an interesting contrast between the roles of historical analogies in foreign policy decision making vs. newspaper articles. When the task is advocacy for policy choice, a compelling historical analogy will be one in which the causal mechanisms are as similar as possible to the current situation so that similar actions are likely to lead to similar results. Instead, newspapers spend more time at the early stages of sense-making to help the audience understand just a few features of the current situation. Newspapers thus offer a much broader range of historical analogies without much regard to maximizing similarity.

The second phase of this project involved the study of historical analogies that might be relevant to cyber conflict. The work was done as part of a project on analogies to cyber conflict that was personally sponsored by General Keith Alexander when he was head of CyberCom. The PI's report provided a repertory of 35 analogies that can be relevant to issues related to cyber conflict. Analogies such as these can serve several purposes: to motivate (by fear or inspiration), to demonstrate what is possible, to provide examples from the past of things to avoid, and to illuminate particular features of past events that might be worth thinking about in preparation for cyber conflict. The report described the implications of each analogy. These implications can be thought of as lessons from the past that can be useful once again, despite important changes in technology, doctrine, organization and political context. The items were organized in sections on historical analogies from before, during and after World War II, and a section on functional analogies such as those inspired by biology. The report included an appendix on a tactic that has been used by the Chinese that is quite distinct from Western conceptions of deterrence, namely the false denial of retaliatory intent. The report was briefed to Gen. Keith Alexander, and published in a book of essays on cyber analogies that he commissioned (Axelrod, 2014).

The third phase of the project developed a mathematical model of the timing of cyber conflict. It took 15 years, from 1945 to 1960, to understand the strategic implications of nuclear technology. The primary motivation of this phase of the work was to help avoid a similar delay in understanding the strategic implications of cyber technology.
The model was inspired by the historical analogy of how the British exploited their control of German agents in World War II. In that case they waited for a very high stakes situation to exploit their resource. Then they used their resource to mislead the enemy about the location of the forthcoming cross-channel at Normandy. The mathematical model was published as “The Timing of Cyber Conflict,” co-authored by PI with his

post-doctoral fellow, Rumen Iliev (Axelrod and Iliev, 2014). This work has already received widespread attention including *Science*, *Nature*, *ArsTechnica*, and BBC World News Service. For example, *Science* called it "a solid logical foundation for fresh thinking in the cyber security field." http://news.sciencemag.org/technology/2014/01/cyberwar-surprise-attacks-get-mathematical-treatment. The work has also been reviewed in Chinese and Russian media:

http://news.china.com.cn/live/2014-01/14/content_24328183.htm
http://news.gxtv.cn/201401/news_1239394151.html
http://www.vesti.ru/doc.html?id=1195627
http://www.securitylab.ru/news/448886.php

The PI has a pending AFOSR proposal to extend the work on cyber conflict. The proposal includes (a) building game theoretic and related types of models to take into account strategic interactions between various state (and non-state) actors, (b) making more precise the distinctions and concepts needed to enhance the sophistication of the analysis, and (c) specifying metrics for tracking key variables in the analysis. The goal is to promote understanding of this new domain of conflict in order to mitigate the damage it can inflict, and harness the capabilities it can provide.

Publications

Axelrod, Robert, and Larissa Forster. "How Historical Analogies in Newspapers of Five Countries Make Sense of Major Events: 9/11, Mumbai and Tahrir Square." *APSA 2012 Annual Meeting Paper*. 2012.

Axelrod, Robert, "A Repertory of Cyber Analogies," in Emily O. Goldman and John Arquilla, eds., *Cyber Analogies* (Monterey, CA: Dept. of Defense Information Operations), 2014.

Axelrod, Robert and Rumen Iliev, "Timing of Cyber Conflict," *Proceedings of the National Academy of Sciences*, January 28, 2014, vol. 111, no. 4, pp. 1298-1303.