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Chapter VII

Information Valuation Policies for Explainable Trustworthiness Assessment in E-Services

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Abstract

Information e-services are useful for exchanging information among many users, whether human or automated agent; however, e-service users are susceptible to risk of inaccurate information, since users have no traditional face-to-face interaction or past relational history with information providers. To encourage use of information e-services, individuals must have technology to assess information accuracy and information source trustworthiness. This research permits automated e-service users—here called agents—acting on behalf of humans, to employ policies, or heuristics, for predicting information accuracy when numerous pieces of information are received from multiple sources. These intuitive policies draw from human strategies for evaluating the trustworthiness of information to not only identify accurate information, but also distinguish untrustworthy information providers. These policies allow the agent to build a user's confidence in the trust assessment technology by creating justifications for trust assessment decisions and identifying particular policies integral to a given assessment decision.

Introduction

Increasingly, e-services are becoming a common method of exchanging information among a wide range of users. Information e-services include Web sites like eBay (eBay, 2006), which utilizes a centralized reputation exchange mechanism to assess the trustworthiness of buyers and sellers, and Epinions (Epinions, 2006), which provides a forum for information exchange about the quality of goods and services. Online information exchange, however, leaves users susceptible to risk of inaccurate information, since users have no traditional face-to-face interaction or no past relational history with information providers. Thus, information sources find it easier to lie about the information they provide, since retribution may be difficult.

To avoid the influence of untrustworthy information sources, system designers have historically emphasized "hard security" measures, including such technologies as user authentication and encrypted transmission. Even with infrastructure protections in place to verify users and ensure transmission integrity, critical security questions remain unanswered—about user authenticity, intent, and competence (Falcone, Pezzulo, & Castelfranchi, 2002), and self-confidence (Barber & Kim, 2002a)—that suggest potential vulnerabilities. These questions can only be answered by considering the content of provided information. Specifically, the trustworthiness of incoming information and information providers must be examined to identify accurate information, especially when hard security measures fail.

If the public is to be encouraged to utilize such information e-services, individuals must be provided with technology to assess information accuracy and the trustworthiness of information sources. Information trustworthiness assessment accomplishes three purposes: (1) e-service users receive more accurate information, (2) untrustworthy information providers are identified and isolated, and (3) the user's confidence in the trust assessment technology leads to increased utilization of the e-service. However, since the accuracy of information can depend on numerous factors, such as the trustworthiness of the provider and the age of the information, this information trustworthiness assessment problem is no simple task.

This information trust assessment research permits automated e-service users—here called agents—acting on behalf of humans, to employ a set of policies (Fullam & Barber, 2004), or heuristics, for predicting the accuracy of information when numerous pieces of information are received from multiple sources. These intuitive policies draw from human strategies for evaluating the trustworthiness of information. The information valuation policies, to be discussed, not only identify accurate information, but also distinguish untrustworthy information providers. An agent's use of these information valuation policies builds the human user's confidence in the trust assessment technology by creating justifications for trust assessment decisions that point out the particular policies integral to a given assessment decision.

The information selection algorithm presented here values incoming information—according to expected accuracy—based on a set of intuitive information valuation policies that justify the derived estimate. Information valuation policies are defined based on estimated source trustworthiness, corroboration by other sources, and certainty expressed by the source. The algorithm values incoming information against these policies, evaluating tradeoffs in cases of policy conflicts, and information with highest estimated quality is given priority when information is merged to form estimates. The direct mapping from policies to algorithm