Advanced Internet Data Search Portal for Environmental Applications

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**Performing Organization:** Chief of Naval Operations (CNO), Environmental Readiness Division (N45), 2000 Navy Pentagon, Washington, DC, 20350-2000

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Motivation for Project

- Effective Government decision-making for Environmental, Safety and Occupational Health (ESOH) technology investments and operations requires current information on many issues, including:
  - Related technology developments and trends
  - Active organizations / individuals

- Massive amounts of relevant information exist on the web, but are scattered across many sources and are often not readily available
  - Technology press releases
  - Technical and trade journals
  - Organization web sites
  - Conference proceedings

- Gathering and understanding this data is a significant challenge for program managers, technology developers, technology purchasers, and other decision-makers
The Problem
General search engines index only the “Surface Web” – only reaching 16% of the available information

16%

Surface Web

84%

Hidden Web
Categories of Web Information

SURFACE WEB
- Free Access
  - Indexed by search engines such as Google

HIDDEN WEB
- Free Access
  - Not indexed by traditional search engines
  - Need to know where to look and how to search

- Restricted Access
  - Paid Subscription or Registration
  - Not indexed by traditional search engines
  - Need to know where to look and how to search

16% 64% 20%
## Deep Web Examples

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Sample Sites</th>
<th>Find Using Google?</th>
<th>Find with Deep Web Search?</th>
</tr>
</thead>
</table>
| **New Product Announcements** – Sites that publish press releases, product announcements or featured products | GlobalSpec – Product Announcements  
Reed Business Information                                                        | No                 | Yes                        |
| **Trade Journals** – Journals devoted to specific applications, typically include product directories, product announcements, articles by company representatives | Pennwell – Water & Wastewater International  
Paint & Coatings Industry Magazine                                                | No                 | Yes                        |
| **Technical Literature** – Technical journals containing articles from universities and companies | SciRus  
SciTation  
Google Scholar                                                            | No                 | Yes                        |
| **Product directories**                    | Thomas Register  
Global Spec – product directory                                                | Limited            | Yes                        |
| **Funded Research**                        | EPA Funded Research Clu-In                                                    | No                 | Yes                        |
The Benefits of a Deep Web Search Portal

- Opening up relevant portions of the hidden Web (84% of the total web) to routine searching – would allow a consistent set of resources to be available to all users.
- More targeted searching of the best sites – site source list updated by site manager so new sites become available to all users as they are identified.
- Automatic quick searches of the best sites for priority topics and materials needed – user does not need to learn the search commands for several different sites.
- Faster searches of relevant Web sites for environmental technologies – cuts wasted time finding sites.
- On-line ability to organize and screen post-search results – cuts wasted time to evaluate initial search results.
- Reduced risk of missing key information that could affect future environmental actions.
Task Objectives

1. Develop and test an advanced, strategic data search and analysis system prototype based on commercial-off-the-shelf (COTS) tools for online searching

2. Identify a Department of Defense (DoD)-wide group of potential system users and other stakeholders to test the prototype design and support operational implementation

3. Develop the business model for operational system deployment and the roadmap to full implementation for DoD users
Objective 1 Accomplishments-
Prototype System

- Completed User Needs Assessment
- Completed Prototype System Design
  - Screened 34 COTS deep web search engines
  - Evaluated 7 leading COTS deep web search engines
  - Selected 2 COTS vendors for demonstration
    - Bright Planet (http://www.brightplanet.com/)
    - Deep Web Technologies (http://www.deepwebtech.com/)
- Developed Prototype Advanced Web Search Portal
- Completed Proof of Concept Demonstration/ Validation for the two candidate systems
- Identified a third candidate system with potentially superior capabilities at reasonable cost – Exalead (http://www.exalead.com/search)
### Deep Web Mining Approaches

<table>
<thead>
<tr>
<th>APPROACHES</th>
<th>HARVESTER</th>
<th>FEDERATED</th>
<th>CRAWLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA COLLECTION METHOD</td>
<td>Collects materials from identified sites based on defined filter, reindexes materials for additional search capabilities</td>
<td>Connections are configured for defined Web sites, search is run simultaneously on all sites</td>
<td>Indexes designated sites, index identifies key concepts and incorporates additional capabilities</td>
</tr>
<tr>
<td>ADVANTAGES</td>
<td>Focused collection reduces search time</td>
<td>Searches are not restricted by filter concepts</td>
<td>Searches are not restricted by filter concepts</td>
</tr>
<tr>
<td></td>
<td>Material can be organized into categories for browsing</td>
<td>Limited field searching may be available</td>
<td>Taxonomy or search suggestions available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Results are always current</td>
<td>Provides both speed and flexibility of search topic</td>
</tr>
<tr>
<td>DIS-ADVANTAGES</td>
<td>Certain sites, such as <em>GlobalSpec</em>, cannot be harvested</td>
<td>Quality of search results depend on quality of each site’s search engine</td>
<td>Proof-of-concept not completed</td>
</tr>
<tr>
<td>EXAMPLE SYSTEMS</td>
<td>BrightPlanet</td>
<td>Deep Web Technologies</td>
<td>Exalead</td>
</tr>
</tbody>
</table>

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This table outlines the Deep Web Mining Approaches, detailing the methods, advantages, disadvantages, and example systems for each approach. The table highlights the benefits and limitations of each strategy, providing insights into how materials can be efficiently collected and searched on the Deep Web.
Key Features of the Prototyped Systems

Design Concept:
- “One-stop shopping” Web portal for searching pre-selected online sites, including deep Web applications, to access ESOH technology, news and other information
- Efficient, useful responses to straightforward search queries

Key Components:
- COTS deep Web search tools (three tools selected for evaluation)
- Search results provided as highly ranked URL locations
- Search results files can be manipulated for screening and organization of key content

Access: Password-protected access for authorized DoD users

User Interface: User-friendly to accommodate novice searchers
## Objective 2 Accomplishments – Project Stakeholders

<table>
<thead>
<tr>
<th>Agency</th>
<th>Organizations</th>
<th>Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSD</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Army</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Navy, Marines</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Air Force</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>NASA</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Objective 3 Accomplishments-
Business Model (Still Being Refined)

- Use DENIX as Search Engine Host, User Access, & Help Desk
- License Deep Web Search Engine via DENIX Program Office
- Use ESOH Advisory Groups to define lists of primary web sites for searches to keep system responsive to their search requirements:
  - PAO Review
  - RDT&E Investment
  - Emerging Contaminants Tracking
  - Equipment/Services Procurement
- Contract for Paid Subscription Sites via DENIX Program Office
- Advisory Group & Search Engine Support provided by NDCEE
- Cost Sharing Between DENIX Program Office & Primary Users
  - Target Using Organization Cost About $50K
Next Steps

- Plan and execute final COTS system proof-of-concept demonstration (June 2007)

- Final Design Report (July 2007)

- Technology Transfer Information Report: Business model and roadmap to operational system design and use (August 2007)

- Final Task Report (September 2007)
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