Priority Intelligence Requirement Answering and Commercial Question-Answering: Identifying the Gaps

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Outline

• Disclaimer
• Priority Intelligence Requirements
• Question-Answering Technologies
• PIR-Answering Requirements
• Gaps
• Conclusion
Disclaimer

This paper does not represent an endorsement by the Army Research Laboratory of any of the commercial products discussed.
Priority Intelligence Requirements: Doctrine

• Priority Intelligence Requirements (PIRs) are “those intelligence requirements for which a commander has an anticipated and stated priority in his task of planning and decision making”
  – FM 2-0 “Intelligence, section 1-32
• Ask a single question.
• Are ranked in importance.
• Are specific: Focus on a specific event, fact or activity.
• Are tied to a single decision or planning task the commander has to make.
• Provide a last time by which information is of value (LTIOV).
• Are answerable using available assets and capabilities.
Priority Intelligence Requirements: Structure
# Question-Answering Technologies by Data Representation Type

<table>
<thead>
<tr>
<th>Information Source Representation</th>
<th>Common Application</th>
<th>Advanced Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tables (Relational databases,</td>
<td>Structured Query Language (SQL)</td>
<td>Wolfram Alpha</td>
</tr>
<tr>
<td>spreadsheets, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text</td>
<td>Web search engines (Google, Ask, etc.)</td>
<td>TREC QA track; Aquaint (Advanced Question-Answering for Intelligence) systems</td>
</tr>
<tr>
<td>Tagged Text</td>
<td>Google Patent Search</td>
<td>Metacarta; Semantic MediaWiki; Palantir</td>
</tr>
<tr>
<td>Logic Statements</td>
<td>Prolog</td>
<td>Powerset (Microsoft Bing); Cyc</td>
</tr>
<tr>
<td>Trusted Teammates (Personal</td>
<td>Personal communication</td>
<td>Yahoo! Answers; Army Intelligence Knowledge Network Shoutbox</td>
</tr>
<tr>
<td>Knowledge)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.vistology.com

VIStology, 15th ICCRTS, Santa Monica CA

5
Structured Data Q-A: Wolfram Alpha

Where was Elvis born?

Input interpretation:
Elvis Presley | place of birth

Result:
Tupelo, Mississippi, United States

Country data source information
- Primary source:
  - Wolfram Mathematica CountryData

Background sources and references:

People data source information
- Primary source:

Background sources and references:
Google

where was elvis born

Where was Elvis Presley Born?
Frequently asked questions about Elvis and his birthplace.
memphis.about.com/od/elvis//elvisbirth.htm - Cached - Similar - ☞ ☞ ☞

Where was Elvis Born?
Question: Was Elvis Actually Born in Memphis? Answer: No. Elvis was born in a two room house in Tupelo, Mississippi. He and his family moved to Memphis in ...
memphis.about.com/od/memphismusicclaq/t/elvisborn2.htm - Cached - Similar - ☞ ☞ ☞

Elvis Presley - Wikipedia, the free encyclopedia
Elvis Presley was born on January 8, 1935, in Tupelo, Mississippi, to Vernon Elvis and Gladys Love Presley. In the two-room shotgun house built by his ...
en.wikipedia.org/wiki/Elvis_Presley - Cached - Similar - ☞ ☞ ☞

Elvis Presley biography: life of Elvis Presley: Elvis Aaron Presley
Elvis Aaron Presley, in the humbllest of circumstances, was born to Vernon and Gladys Presley in a two-room house in Tupelo, Mississippi on January 8, 1935. ...
www.elvis.com/elvisology/bio/elvis_overview.asp - Cached - Similar - ☞ ☞ ☞

Elvis Presley
Gladys, Elvis and Vernon Presley 1937. Born January 8, 1935, in East Tupelo, Mississippi, Presley was the son of Gladys and Vernon Presley, a sawing machine ...
www.history-of-rock.com/elvis_presley.htm - Cached - Similar - ☞ ☞ ☞
Tagged Text: Metacartava
Logic-Based Q-A: Powerset
Social Q-A: Yahoo! Answers

Resolved Question
In Turkish wikipedia it says Elvis Presley was born in İzmir and was dead in İstanbul. Is it true?
2 months ago
Report Abuse

Best Answer - Chosen by Voters
He was born in Tupelo, Mississippi and died in Memphis Tennessee. The bad thing about wikipedia is that anybody can alter basically whatever they feel like. You can go and change it yourself if you like, just press where it says ‘Değiştir’ and you will be able to edit the article.
2 months ago
100% 2 Votes
Report Abuse

Is this what you are searching for?
Social Question-Answering: Vark

May 15, 2010 | Question about Elvis edit label

You

Does anybody know where Elvis was born? I don't need the date, just the location.

Answer 1

+ 1 minute

Gregory W. 
50 / M / Oakland, CA

Tupelo, Mississippi

You

Thanks!

You

Send a follow-up message

Was Gregory's answer helpful? Yes • Kind of, but not for me • No

Flag as inappropriate
# PIR Answering Requirements

<table>
<thead>
<tr>
<th>Source (Reporting Data)</th>
<th>Each element of information in a PIR answer should have a determinate source, time and location detailing who provided the information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability/Credibility/Accuracy/Confidence</td>
<td>Each element of information in a PIR should have an assessment of the accuracy of the information provided, how certain it is, and how reliable the source is. The overall answer provided should be provided with an assessment of the analyst’s confidence in it. (STANAG 2022)</td>
</tr>
<tr>
<td>Activity/Unit/Size/Equipment/Time/Location</td>
<td>PIR answers often involve analyzing what happened. This requires a representation of data in terms of events, when they happened, how they happened (by means of what equipment), who made them happen and so on</td>
</tr>
</tbody>
</table>
## PIR Answering Requirements (cont’d)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIR to PIR Answer Fusion</td>
<td>Answers to multiple SIRs must be fused into an answer to the overarching PIR.</td>
</tr>
<tr>
<td>Query Persistence</td>
<td>PIRs are standing queries, and any new relevant information must be considered in answering them</td>
</tr>
<tr>
<td>Partiality</td>
<td>Partial answer elements must be identified and combined across data sources</td>
</tr>
<tr>
<td>Incrementality</td>
<td>PIR answers may require an assessment of how things have changed with respect to an information request over the last specified interval</td>
</tr>
</tbody>
</table>
# Gaps: COTS Q-A and PIR Answering

<table>
<thead>
<tr>
<th>PIR Reqs.</th>
<th>Tables</th>
<th>Text</th>
<th>Tagged Text</th>
<th>Logic/Triples</th>
<th>Teammates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>At most, source document URL or reference source.</td>
<td></td>
<td></td>
<td></td>
<td>Maybe</td>
</tr>
<tr>
<td>Reliability/Credibility</td>
<td>“Curated” data</td>
<td>PageRank &amp; Similar information quality metrics</td>
<td>“Curated” data</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>What/When/Where</td>
<td>None known</td>
<td>No</td>
<td>Possibly, but no known systems</td>
<td></td>
<td>Maybe</td>
</tr>
<tr>
<td>SIR to PIR Fusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Persistence</td>
<td></td>
<td></td>
<td>Periodic Scheduled Requerying, not forward-chaining inference</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Partiality</td>
<td>Yes*</td>
<td>Only List Questions</td>
<td></td>
<td>Yes*</td>
<td>Yes</td>
</tr>
<tr>
<td>Incrementality</td>
<td>Timelines, incremental Term Clouds, Trendlines, as change over time, etc.</td>
<td>No, Triples atemporal</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Cross-document coreference issues a problem.
Conclusion

• There have been many innovations in automated question-answering by computers in recent years.

• Computer-assisted social question-answering systems like Vark and Yahoo! Answers are increasingly popular, too.

• Significant gaps remain between COTS question-answering systems and what PIR answering requires.