From AI Methodology to Internet Startup: The Story of the Softbots Project

Oren Etzioni

Department of Computer Science
University of Washington

http://www.cs.washington.edu/homes/etzioni/

UW Softbots Project

- Dave Christianson
- Bob Doorenbos
- Greg Fitchenholtz
- T.J. Goan
- Keith Golden
- Cody Kwok
- Marc Langheinrich
- Greg Lauckhart
- Neal Lesh
- Sujay Parekh
- Mike Perkowitz
- Rich Segal
- Erik Selberg
- Jonathan Shakes
- Dan Weld
- Oren Zamir

Pre-historic Softbot Dreams (circa '91)

- **Testbeds:** generate surprises, problems we didn't think of..provide a way of testing our ideas.
- **Technology:** softbots will become useful artifacts---always a challenge for AI.
- **Softbotics:** a new breed of programs with continuous existence, autonomy, the ability to clone themselves and...

Outline

I. Softbots: Definition and Perspective.

II. Softbots as testbeds:
Rodney --- The Internet Softbot.

III. Softbot technology:
Jango Softbot. (http://jango.excite.com)

I. Softbots

Softbot: an "intelligent" program that uses software tools on a person's behalf. (Etzioni & Segal '92).

Lycos, INSPEC, finger.
print, mail, copy file.

- **Software:** not physical; not simulated.
- **Active:** unlike the Unix Consultant, Microsoft wizards.
- **Integrated:** unlike interface agents.

Softbots and Brooks I

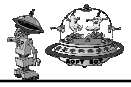
- Obey Brooks's methodology.
- But software testbed is easier than vision, sonars, fragile grippers.
- Closer to a "level playing field" w/ humans.
- Discount evolutionary argument, subsumption architecture.

Softbots and Brooks II

- The study of intelligence ought to encompass both software intelligence and physical intelligence.
- Key: not anti-robotics, but anti-extreme Brooksian position that robotics is the **only** way to study AI.

Softbot-Based Interfaces (Etzioni & Weld '94)

- **Goal oriented:** person says *what*, softbot responsible for *how* and *where*.
- **Integrated:** a uniform interface, leveraging existing services.
- **Expressive:** additional expressive power beyond underlying tools.
- **Tolerant:** softbot attempts to decipher incorrect or incomplete requests.



II. How to build softbot-based interfaces?

Rodney softbot: leverage 40+ years of planning research!

- **Goal oriented:** person states goal; Rodney generates a plan.
- **Integrated:** plans invoke multiple tools.
- **Expressive:** planner translates goal logic into action sequences.
- **Tolerant:** incomplete information captured by variables: (person ?P) (lastname ?P WELD)

Advantages of Planner

- Automatic subgoaling.
- Dynamic backtracking.
- Leverage existing Web resources.
- Extensible model of the Web.

A planner is worth 1,000 scripts!

Softbot Planning Challenges

- Plan with incomplete information:
  - Represent information-gathering actions & goals.
  - Interleave planning with execution.
  - Mix causal and "sensory" actions.
  - Keep planning tractable.
- Guarantee softbot autonomy is "safe".

Representation: KR '92; KR '94; KR '96.
Algorithms: AAAI '94; AAAI '96; AIJ '97.
The First Law of Softbotics: AAAI '94.

Information goals + causal actions

Goal: locate and delete the file **"old-server-log". (file ?F) (name ?F "old-server-log") (deleted ?F)**

Softbot's plan:

1. Rename **"AAAI.tex" to "old-server-log".**
2. Delete the file **"old-server-log".**

What went wrong?

Information goals are temporal! (KR '96)

- Typically, goals are satisfied when plan is done.
- Who was the president **in 1883**?
- Solution: temporal logic???
- Tractable solution: distinguished time points.

Initially [(name ?F "old-server-log")] (deleted ?F)

Assessment of Rodney (1991 -- 1997)

- Effective testbed for planning, machine learning, KR.
- Goal-oriented interfaces: natural challenge for planning; ideas carried over to database integration.
- Rodney was slow...
  - AI should be "Almost Instantaneous".
- Cost/benefit miscalculation!

Softbot Learning Challenges

Problem: declarative representation is expensive.

Solution: ***learn*** to interact with Web resources, based on a sample of their behavior! (IJCAI '95).

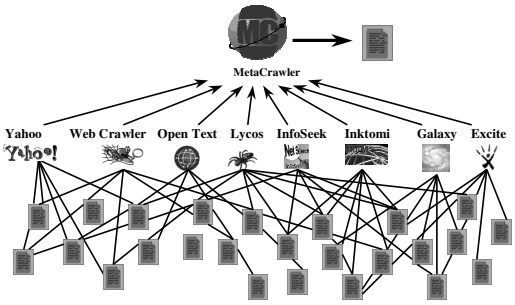
Subproblems:
discovery;
parsing (AA '97; IJCAI '97);
semantics (IJCAI '95);
evaluation.

Shopbot Learning Experiment (AA '97)

Home Page URL	Navigator	eXceed	Word	Quicken
http://www.internet.net	$28.57		$282.71	$43.06
http://www.cybout.com/cyberian.html	36.95		289.95	42.95
http://necxdirect.necx.com	31.95		329.95	42.95
http://www.sparco.com	35.00		312.00	49.00
http://www.warehouse.com	39.95		×	×
http://www.cexpress.com	...	...	×	...
http://www.avalon.nf.ca	44.95			
http://www.azteq.com	...		...	...
http://www.cdw.com			289.52	×
http://www.insight.com/web/zdad.html			315.00	
http://www.applied-computer.com/twelcom.html		349.56		43.47
http://www.sidea.com	59.00			

Challenge: useful softbot technology!

III. The MetaCrawler Softbot (1995 -- ??)

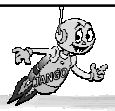


The Jango Softbot (1996 -- ??)

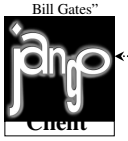
- **Problem:** convenient on-line shopping.
- **Solution:** apply MetaCrawler architecture to on-line vendors.
- **Bug:** vendors blocked BargainFinder!
- **Fix:** create the Jango client.

(clients facilitate intelligent processing...)

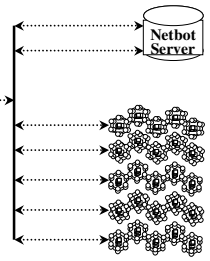
The Architecture



1. The Client:
--Submits "that book by Bill Gates"

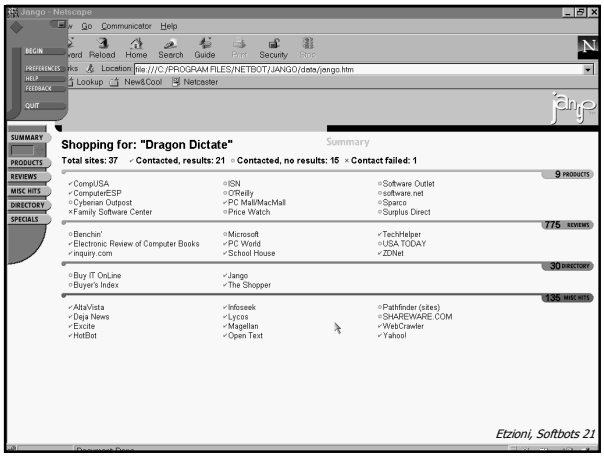


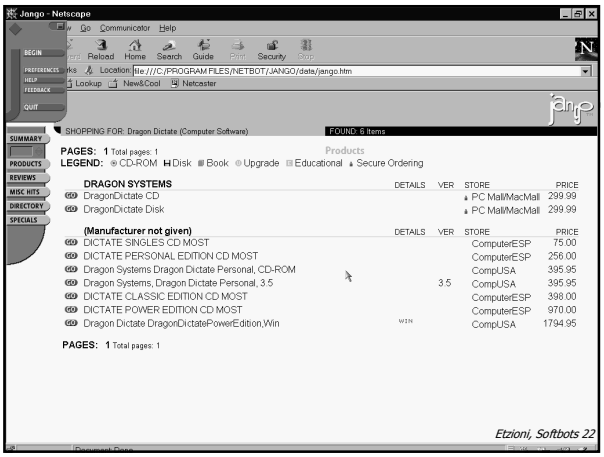
4. The Client:
--Queries sources
--Filters results
--Presents reports

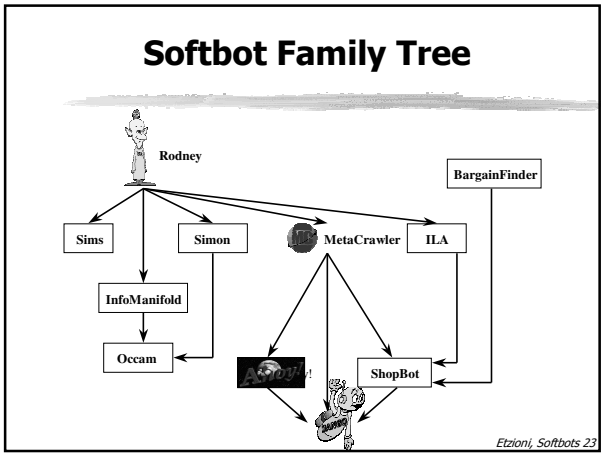


2. Our Server:
--interprets query

3. Multiple Sources Queried Simultaneously
--Amazon.com,
--American Library Association...

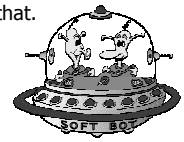






Conclusions

- Where are we vis-à-vis the softbot dreams?
  - Rodney was a planning/learning testbed.
  - Jango is a product (see http://jango.excite.com).
  - Both are softbots!
  - The softbotics "dream" is still just that.
- Intelligent WebWare: softbots, smart search, adaptive web sites.



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