SEARCHBOTS.NET: THE INFLUENCE OF A NARRATIVE INTERFACE ON THE MOTIVATION LEVELS OF USER CONTRIBUTION TO AN OPEN CONTENT SEARCH ENGINE

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Contents

Central Proposition

This study sets out to explore and test the application of narrative and personification to the interface design and user experience of a search engine. The motivational and collaborative aspects of a search agent narrative will be examined and tested as a technique for increasing the volume and quality of data submitted to an open-content search engine by its users.

Searchbots.net Background

Searchbots.net is an existing directory-based website created in 1999. The website was originally conceived as a proof of concept for clients of the new media design studio Morse Media highlighting the ability to personalize graphics using Flash software.
I was a director at Morse Media and was the lead developer for the Searchbots website. The design and functionality of the website was created in collaboration with designer Matt von Trott.

A key part of the successful project was its interface, one that used the metaphor of a popular Internet myth, the search agent or robot. The popular Internet meme of an autonomous, intelligent search agent can be traced back to the very beginning of the public Internet and early personal computers. The 1987 video "Knowledge Navigator" by Apple Computer portrayed an image of the butler-like relationship between a user and a hypothetical search agent (Fig. 2). In 1990 the popular science fiction writer Douglas Adams starred in a BCC fantasy documentary film "*Hyperland*" which followed Adams on a journey into an interconnected information space. His interactions in this space took place by talking to a search agent visualized in whichever guise he fancied, from butler to Neanderthal.

The Searchbots interface allowed the user to create personalized robots or agents that would search the Internet on the user's behalf. This was achieved through interface design, innovative Macromedia Flash techniques and a narrative embedded into the interface. The narrative presented within the interface used the promise of a search agent to encourage users to build their own Searchbot and program it with a set of keywords to keep searching for. The Searchbot promised to report back when it found relevant websites. The tone and language used within the website was very friendly and informal. The Searchbots addressed the users directly and many people replied directly to the emails they received from their Searchbots.

Searchbots proved to be very popular and in the first year over thirty thousand Searchbots were built and it was mentioned on many websites as being a fun and imaginative search service that suggested "cool" websites that wouldn't normally be found at the top of the list on other search engines.

In fact the website was very similar to other existing directory-based search engines being maintained by several content editors. The interface, narrative and rhetoric used promised more than the actual abilities of the search technology. Rather than actually having a software search agent creating search results, the website relied on the manual entry of metadata about websites by a handful of part-time editors. Because of the manual nature of entering search results the website became unsustainable as it grew and people demanded better and broader results. As Searchbots was simply a technical demonstration website without a way to finance full-time editors or develop search algorithms Morse Media decided to shut the website after being live for two years.

What stood out as being very successful in the development of Searchbots was the way narrative was used to establish the story of a search agent working on behalf of a user. The narrative was fully integrated into the interaction and user experience of the website. Ideas and stories were introduced and then smoothly transitioned into actions for the user to perform. In essence, this theatrical nature was the key to the initial success of Searchbots.net. People responded to the narrative by building and using Searchbots even though it struggled to deliver on the promised "search agent" concept.

The introductory animation made bold claims to have solved the problem of the Internet's "unyielding chaos" with "heroic nano-bots" from a "lab buried deep in the South Pacific" (Morse Media, 1999). This, along with the retro-cartoon style of the Searchbots and a user's ability to give their Searchbot a name, provided users with a seductive, staged environment and a character for people to identify with and ignite their imaginations. The fact that the metadata-based inner workings of the search engine were the same as any other on the Internet and the fact that search results were limited did not stop people believing their own Searchbot was doing something special and unique for them.

The developers of the website helped perpetuate the myth of a search agent by conducting conversations with users via email pretending to be their Searchbot. When

users first created a Searchbot a personalized email was sent to the user written as if by the Searchbot. Many users replied to the initial email encouraging their Searchbot to do a good job searching on their behalf. This provided the perfect opportunity to perpetuate the agent illusion by engaging the user in an ongoing email dialogue.

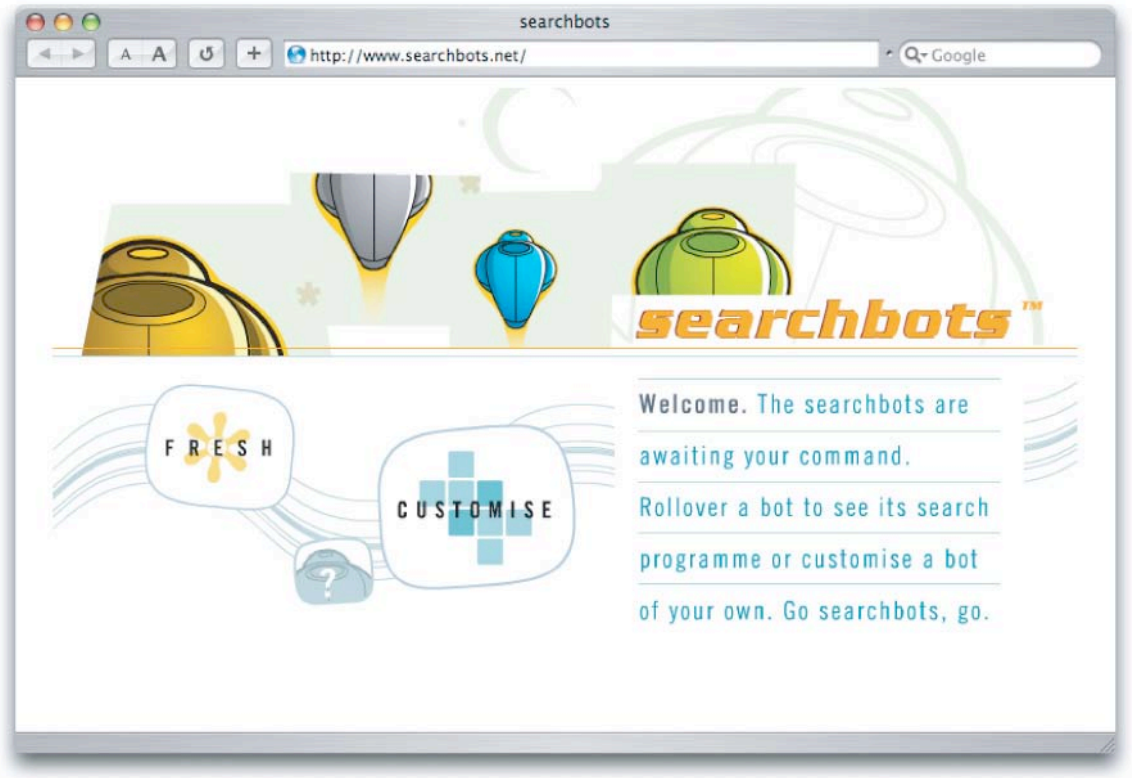


Fig. 1. First version of Searchbots homepage.

Search Context

Internet search engines currently use several basic methods of collecting metadata about websites. One approach is the use of automated web robots that trawl the Internet creating large indexes of textual information. Algorithms can then be applied to this data creating various results and rankings. Popular opinion on what constitutes a good quality website is often hard to derive from collected textual information alone. Search engines like Google use more sophisticated approaches like Pagerank™ which measures the popularity of a website by treating a hyperlink between websites as a vote for the destination website. Another common approach is human created directories of information submitted by the public and then moderated by editors of the website. As is the case with Yahoo, editors are employed by the search engine to update website listings or members of the public who are passionate about specialist subject areas are

invited to participate in websites like the Open Directory Project. Both of these approaches require large technical resources or the constant attention of editorial staff.

Inspired by Peer 2 Peer software like Napster and Bittorrent, along with the philosophies of open source software development projects like Linux, several projects have appeared on the web which allow the general public to contribute and edit website content as they please. Wikipedia, a user maintained encyclopaedia, is a very high profile example of the success of this approach with over two million entries created and maintained by users. These websites are often referred to as "open-content" websites. The responsibility of data gathering and the moderating of information in an open-content website has been shifted from the website creator to the audience. Everybody visiting the website can contribute to the collective knowledge of the website if they wish.

The adding of open-content information can either be manual, by asking people to fill out forms or can be derived automatically from the way users move through a website. For example, when you browse the Amazon website every link you click on and every product purchased is recorded into a profile of your behaviour. This profile is then run through a collaborative filtering system with other people's profiles and loose associations between products can be made in the form "People who purchased this product also bought x". This approach to content allows popular opinion to be captured automatically as the audience uses the website and can improve the accuracy of popular opinion represented over the two basic methods outlined above. These approaches to collecting metadata will be explored in the creation of an open-content search engine for Searchbots.

Research Aims

To examine how the use of a narrative interface may influence the way people contribute information to an open-content search engine.

To examine the dynamics of a website using collaborative filtering and the influence an animated interface agent has over people's enjoyment of, and contribution to, the website.

To assess if personifying a search agent within a narrative interface increases the motivation level of users to contribute information.

Methodology

The existing Searchbots.net website will be used as a precedent, looking at the various strategies employed to date and the observations made by members of the original development team. Specific problems identified in the original site will be documented and prioritized.

The focus of this Masters is the central issue of self-sustaining data generation and evaluation. With this in mind, the research will be limited to how narrative techniques can help improve the website's presentation of requests for data from its users.

Several interface prototypes will be developed that test the various characteristics of agent interfaces and their motivational and collaborative influence on the user.

To test these prototypes an iterative design process will be employed allowing refinement based on user testing and feedback. An iterative method will allow rapid prototyping using various techniques like paper prototyping and skeleton websites. The speed and ease of these techniques allows multiple ideas to be developed and tested quickly without creating finished work. This is especially important in the digital media area as developing fully working prototypes is labour intensive and requires programmers and other specialists to complete. There will be a clear separation of aesthetics and functionality in the early iterations of the interface. By concentrating on the visual elements of the interface and its functionality separately, a number of iterations can be achieved, increasing the accuracy and success of a final design.

Searchbots.net will be used as a test website for interface trials and members of the existing website will be asked to test and provide feedback on the prototype via an online survey.

Copyright

The existing website Searchbots.net is owned by Mark Zeman and was initially developed by Morse Media Ltd during the period 1999 to 2001.

The bulk of the research covered by this project will be into specific interface techniques and will be covered by the Massey University Intellectual Property (IP) policy resulting in shared IP between Massey and the staff member Mark Zeman.

Searchbots.net, its existing databases and any modifications required to run various interface prototypes will remain the sole property of Mark Zeman. Searchbots.net has kindly allowed temporary access to its user database and website for short term testing purposes only.

See Appendix I: Copyright Declaration.

Ethical Standards

Existing users of the Searchbots.net website were invited to test the prototype. An email invitation to participate in the interface trials was sent to existing subscribers. If users wished to be involved they consented by visiting a website page and agreeing to be involved in the research. A description of the research and a privacy policy was shown on the acceptance page.

Periodic updates on the research and status of the interface tests were sent to users by email if requested. After using the interface, users were asked to fill out an online questionnaire providing feedback on the interface. At any time people were able to withdraw from the research using a form included on the research page and at the bottom of any email received.

As the existing users are already members of the Searchbots.net website, they are covered by the existing website privacy policy.

Users that chose to be part of the research project were able to withdraw from the project at any time and any information specifically collected for the research project was deleted. Unless the user requested that their Searchbot also be deleted only the research specific data was deleted and has not been used as part of the project. A user who withdrew from the research project is still able to continue using their Searchbot.

Literature Review

It's worth noting that there is currently a lack of scholarly literature in the area of interface personification and the use of narrative in interface design. The web and interface design in general develops at an incredible pace. Even though there is evidence to suggest personified interfaces may be effective in engaging users there are few real world applications that use these techniques and very little documentation of those efforts. The literature review that follows examines the related areas and issues that were explored in the construction of the interface prototype for Searchbots.

- Collaboration and Moderation
- Agent Interfaces
- Computers as theatre
- Commonsense
- Personification
- Web 2.0
- PEW surveys

Collaboration & Moderation

Howard Rheingold is a prominent critic and writer specializing in virtual communities, emerging social trends and group dynamics that have been influenced by recent communication technology. In his book, *Smartmobs* (Rheiengold, 2002), he argued that new communication methods provided by the Internet and mobile phones allow us to collaborate and disseminate information in ways we weren't able to before and build smart, ever-evolving mobs of people that can easily outmanoeuvre traditional forms of media. An essential component of a Smartmob is cooperation. As there is no centralized control or point of contact, information and the knowledge inherent in the mob comes only from what people contribute themselves. A user's motivation to participate and the ease of use of these social devices are key elements to their success. If a user gains no reward from interaction with a Smartmob or the quality of information received is low, their motivation to contribute information or train an agent interface is reduced, risking the collapse of the mob. Rheingold explored a number of approaches as to how this dynamic may exist in the mob and what is required for a mob to collaborate successfully.

> Reciprocity, cooperation, reputation, social grooming, and social dilemmas all appear to be fundamental pieces of the smart mob puzzle. Each of these biological and social phenomena can be affected by, and can affect, communication behaviours and practices. Prisoner's Dilemma and game theory are not "answers" to questions of cooperation; rather, they are tools for understanding human social dynamics. Together with common-pool resources (CPR) theory, game-theoretic and other computer-modelling approaches open windows onto the kinds of group behaviour that might emerge with smart mob technologies. (2002, p. 46)

Rheingold highlighted the principles of common good, as developed by Ostrom (1990) for areas of land set aside for the general public, as a key component in the successful growth of a Smartmob. These design principals may also be of use when developing an online common good, enabling a virtual community to self regulate shared resources. These principles are primarily about trust and allowing members of the community to self regulate and moderate any problems that arise without deferring to an authoritarian, hard-and-fast rule based approach.

Ostrom's principles of common good:

- Group boundaries are clearly defined.
- Rules governing the use of collective goods are well matched to local needs and conditions.
- Most individuals affected by these rules can participate in modifying the rules.
- The rights of community members to devise their own rules is respected by external authorities.
- A system for monitoring members' behavior exists; the community members themselves undertake this monitoring.
- A graduated system of sanctions is used.
- Community members have access to low-cost conflict resolution mechanisms.
- For common-pool resources (CPR's) that are parts of larger systems, appropriation, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises. (1990, as cited in Rheingold, 2002)

A similar approach to managing online resources and disputes can be found in the content moderation processes of websites that solicit content from the public. Slashdot.net, a large news website, introduced a karma-based system to reward users who contribute news items and allow others to lower people's karma for frivolous comments. Readers can then set a karma threshold on the desirable comments with each news item thereby filtering out people of low regard.

Wikipedia, an open content encyclopaedia, relies on people's altruistic nature and a belief that nobody wants to destroy a page when anybody can change that page without effort. There's no challenge for the hacker when anybody can alter content. That said, parts of the site do have a layered moderation process and pages can be rolled back to previous versions if malicious changes have been made. Wikipedia states that all articles should be written with a neutral point of view and the majority of people adhere to this, however there have been entries in the encyclopaedia that have caused debate within the community. On rare occasion entries have been locked and people banned from editing the content. This has lead to some criticism of Wikipedia for interfering with the process. Overall the website has been incredibly successful with over two million entries written by the general public which shows just how willing users are to contribute.

Agent interfaces

Fig. 2. Apple Computer Knowledge Navigator

Since the introduction of personal computers and the development of the Internet, the idea of an agent that can search the Internet on behalf of a user has been promoted. Apple Computers created a conceptual video in 1988 to demonstrate the possibilities of an agent based interface called the Knowledge Navigator.

> The Knowledge Navigator depicts a flat book-like device open on the desk of a tweedy-looking professor. In one corner of its display is a bow-tied person who

> turns out to be the persona of the machine. The professor asks this agent to assist him in preparing for a lecture, delegates a handful of tasks, and on a couple of occasions is reminded of other matters. The agent can see, hear, and respond intelligently, like a human assistant. (Negroponte, 1995, p. 93)

Such agent interfaces are often popularized in science fiction film. One such example is the "Bounty Bear" from "*Until The End Of The World*" (Wenders, 1991) whose search function was visualized as a Russian bear running from door to door in a small village hunting for the answer to a query. "I'm searching... I'm searching... Give me a minute... I'm identifying... I've got him... This is your guy", sang the bear as he went about his task.

Fig. 3. The Bounty Bear search agent from the film "*Until The End Of The World*" (Wenders, 1991).

As discussed in the Searchbots.net Background (p. 1) the popular science fiction writer Douglas Adams starred in a BBC fantasy documentary film "*Hyperland*" which showed him navigating an interconnected information space by interacting with a butler-like software agent.

Even though all three of these examples are fictional mock-ups they demonstrate what many would call the ideal human computer interface. The computer and the knowledge it holds simply becomes a person or character we can talk to and question. The user is not forced to learn a new interface, click a mouse, use Boolean search logic or operate in any other method dictated by the limits of technology. Instead the interface is intelligent and responds to the user's needs like a person in a real life conversation would.

Computers as theatre

A key aspect of the agent approach as illustrated by Laurel (1993), a researcher in interactive narrative and human-computer interaction, is that it moves us away from the direct-manipulation desktop metaphor that currently dominates the computer interface experience. When working with files or information in a desktop metaphor the user directly controls the actions of the computer, making a folder, putting a file in the trash, emptying the trash and other such tasks. An agent interface is one where the user gives instructions to a piece of software and it then acts on their behalf. These interfaces are often given a character representation to personify the actions of the agent and help the user to understand that the software is acting on its own, yet under the user's instruction. Laurel (1993) goes on to propose that many of the traditional theatre conventions and ideas of a dramatic production give us another way to think about the interaction that unfolds over time in the computer user interface.

> Unlike a strictly scientific approach, the notion of designed experience leads to a design discipline in which ideas like *pleasure* and *engagement* are not only appropriate but attainable. It emphasizes the intrinsically interdisciplinary nature of design by blurring the edges between application and interface and by incorporating insights and techniques from artistic disciplines, especially drama and theatre. By simply changing their vantage point, designers steeped in computer science and traditional interface theory may discover rich new sources of theoretical and productive knowledge that can be brought to bear on the design of human-computer activity. (Laurel, 1993 p. xix)

Laurel (1993) has adapted the principles of the play and its dramatic techniques into a set of principles to help provoke a different way of constructing the flow and interaction between computer interface and user.

> Design principles for human-computer activity:

- Think of the computer, not as a tool, but as a medium.
- Interface and application should be couched in the same context – namely, the context of the objects, actions, and tools of the representational world.
- Interface metaphors have limited usefulness. What you gain now you may have to pay for later.

- Focus on designing the action. The design of objects, environments, and characters is all subsidiary to this central goal.
- Designing action consists of designing or influencing what kinds of incidents will occur and in what order.
- Represent sources of agency.
- Think of agents as characters, not people.
- An agent should be both responsive and accessible.
- Match diction to character traits. Diction can also be used to reveal point of view.
- Modelling human conversational style is important, but remember that people readily adapt to and emulate the conversational styles of their partners.
- Gesture can be used to reinforce, disambiguate, or replace spoken or written language.
- Multiple modalities are desirable only insofar as they are appropriate to the action being represented.
- Tight linkage between visual, kinaesthetic, and auditory modalities is the key to the sense of immersion that is created by many computer games, simulations, and virtual-reality systems. (Laurel, 1993, pp. 126-161)

Commonsense

A common criticism of agent technology or any sort of collaborative filtering is that the agent's accumulated knowledge can only ever represent a simplified cartoon-like version of the user's interests. If the user delegates decision making and information gathering to an agent with a simplified view of the world and the user's own interests, they will only ever be returned information from a reduced and often crude representation of the world. Steven Johnson, an American popular science author, explored the idea of an agent that is unable to really discern the complicated relationships between what we like and don't like in his book "*Interface Culture: How New Technology Transforms The Way We Create And Communicate"*(Johnson, 1997).

> The humans will just get more stupid, in a kind of regressive co-evolution. Tastes, after all, don't translate easily into simple formulas. Think about the resolution, the texture, of your taste in music and books: certain broad generic categories may be useful in describing your appetites (you tend to like jazz more than classical, fiction more than nonfiction), and you certainly have lists of favorite

> and not-so-favorite artists. But when you zoom in on that possibility space, the generalizations grow less and less useful: you might be a huge Dickens fan, but that doesn't necessarily make you a lover of Victorian serial novels written by men. (Johnson, 1997, p. 193)

Or worse yet, he went on to imagine a scenario where if we leave purchasing and decision making to an agent's reductionist process we may get almost random and expensive mistakes made on our behalf.

> *Wired's* hypothetical machine senses rain and thinks rain gear; but it could just as easily think a thousand other things: book tickets for Caribbean vacation; cancel tee-time; order new aluminium siding; search local classifieds for single white female who "likes walking in the rain." You'll either get a random sampling each time it rains, or they'll come tumbling down the wire at once. In either case, the signal-to-noise ratio will be like a sound check at a Sonic Youth show. Either you'll spend all your time sorting junk from not-quite-junk, or you'll just toss the PDA in the wastebasket and dance off, Gene Kelly-style, into the downpour. (Johnson, 1997, p. 191)

The software Agents Group at the MIT Media Laboratory is hoping to get around this problem by adding some kind of common sense algorithm to the reasoning processes of agents. Their main approach is using data gathered from the Open Mind project, which encourages members of the public to construct and submit thousands of logical commonsense statements about everyday things and concepts. These statements can then be phrased into machine readable logic structures and give the computer a sense of context. What a word might mean in a particular situation can be deduced, rather than randomly chosen among the many meanings often attached to a word in English.

> Our system's source of commonsense knowledge is OMCSNet, a large-scale semantic network that aggregates and normalizes the contributions made to Open Mind Common Sense (OMCS). OMCS contains a wide variety of knowledge of the form "tennis is a sport" and "to play tennis you need a tennis racquet." OMCSNet uses this knowledge – nearly 700,000 English sentences contributed by more than 14,000 people from across the web – to create more than 280,000 commonsensical semantic relationships. (Stocky, 2004, p. 2)

This commonsense data has been used in a predictive text messaging prototype to improve the word choice based on what has been written in the rest of the sentence. For example if the beginning of the text message was “buy me a ticket for movie ill meet u at” and then “th” was entered, using the commonsense data the software knows that movies happen at the “theatre” and would suggest it, rather than the more common “the” and “there” that might be expected. Not only does the prototype improve the accuracy of predicting words based on the computer understanding the context of what is being written, but it is also testament to the web’s power to collect information from the general public. Word games and competitions were created at the Open Mind website to encourage people to submit commonsense statements. A sense was created that people were contributing to something important and that their contribution may even lead to a break-through in the science-fiction-like artificial intelligence field. This sense of usefulness was enough to nurture the altruistic streak in people and encouraged them to submit substantial numbers of statements.

Personification

Several research papers have been conducted into how an agent could be visualized for the user and the effect having a character or guide on screen has upon the user’s enjoyment and understanding of the information presented (Koda, 2003; Swartz, 2003). Koda and Maes (2003), Masters students within the Software Agents Group at MIT Media Laboratory, created a simple experiment using agents personified to various degrees. At one end of the scale the representation was lifelike and at the other abstract and cartoon-like. People were asked to play a poker game with the agents and comment on their ability to read the characters emotions throughout the game.

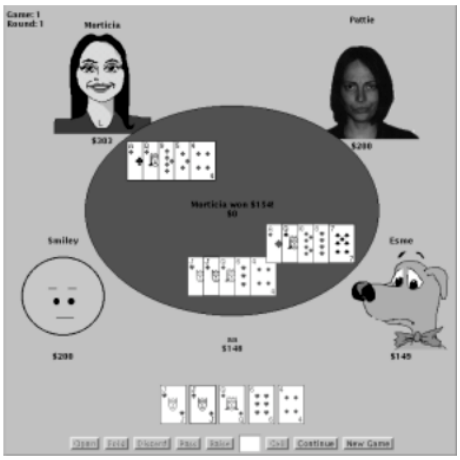


Fig. 4. Poker Game Interface

Fig. 4 shows a simulated poker table with four poker playing agents. Each agent has different representations. The user's hands are shown in front of the table (Koda, Maes. 2003, p. 3).

The results showed that the more realistic the face, the more it was considered intelligent, likable and comforting although the animal character was considered more likable than the human faces. Overall the characters increased the player's engagement with the interactive experience. It was observed that users spent more time trying to interpret the faces of their opponents than concentrating on their own cards (Koda, Maes. 2003, p. 4).

> There are several arguments against personifying interfaces: it takes more effort and lowers performance, leads to over expectations about the system's ability, and increases lack of user control (Shneiderman 95). However, it is clear that faces are useful for entertainment purpose, since engagement is essential for games and people don't care taking more effort for entertainment. Hence it may also be useful for applications which require an engaged user for success, such as education and training. The results on facial features indicate that the level of abstraction and the humanity of an agent changes its perceived intelligence and likeability. Isbister's study shows that people's evaluation about a computer character's intelligence is not based on its true intelligence but its perceived intelligence (Isbister 94). "The look makes difference" effect has to be taken into careful consideration when choosing the appropriate representation for an agent. (Koda, Maes. 2003, p. 4)

How the use of an interface guide can help a user understand the context of information presented and the interface they are interacting with was observed by Laurel (1993) in the Guides project at Apple Computers. Of particular note is how the user used their imaginative ability to flesh out a short clip they were watching and their comfort at knowing that a guide was there alongside them in the process of browsing information, ready to help out if needed. A sense of collaboration and personification is imbued upon the guide with only the smallest of representations shown.

> In the video version, users were introduced to the Settler guide in a segment where the actress appeared out of costume. Because she was charged with delivering information about the operation of the system and the interface at this

juncture, the guide spoke "out of character." We discovered through user testing that users did not even identify the guide in this segment as the same *actress*, and that they imbued her with an entirely different set of traits and functions. They expected this guide to provide help throughout their use of the program, and they perceived the guide as being an ever-present "safety net" and companion [see Karimi et., 1989]. *All of these user responces were based on a single non-interactive video segment of less than two minutes in length.* What began for the designers as a framing device aimed at distinguishing levels of activity quickly became the beginnings of a distinct type of agents: *a frame guide.* (Laurel, 1990, as cited in Laurel 1993, p. 147)

Web 2.0

In 2004 O'Reilly Media coined the phrase "Web 2.0" to capture a shift in the way new websites facilitated collaboration and sharing between users. Rather than Web 2.0 implying a new generation of technology it categorised an approach to developing communities online and allowing open access to user's information. These new Web 2.0 communities often contribute the content that makes up the website and the developers often allow the user submitted content to be spread across the Web.

The photo sharing website Flickr is an example of a very successful Web 2.0 website which currently has over one million new photos uploaded to the website per day. Users upload their photos to Flickr and are then able to tag them with a variety of keywords. This creates a rich pool of metadata for each photo and user, allowing multiple ways to navigate and explore users' photos. Flickr was also one of the very first websites to allow external access to the information submitted by users. Third party developers are able to access all the photos and metadata in Flickr through an Application Programming Interface (API). This has resulted in hundreds of applications or "mashups" being created that mix photos from Flickr with other data sources or presents the photos in innovative interfaces. One such example is the Retrievr search interface (Fig. 5) that allows a user to draw a simple image using line and colour to create a simple composition like a sunset or eye. Retrievr then searches through Flickr trying to match the picture the user has drawn with photos taken by other users.

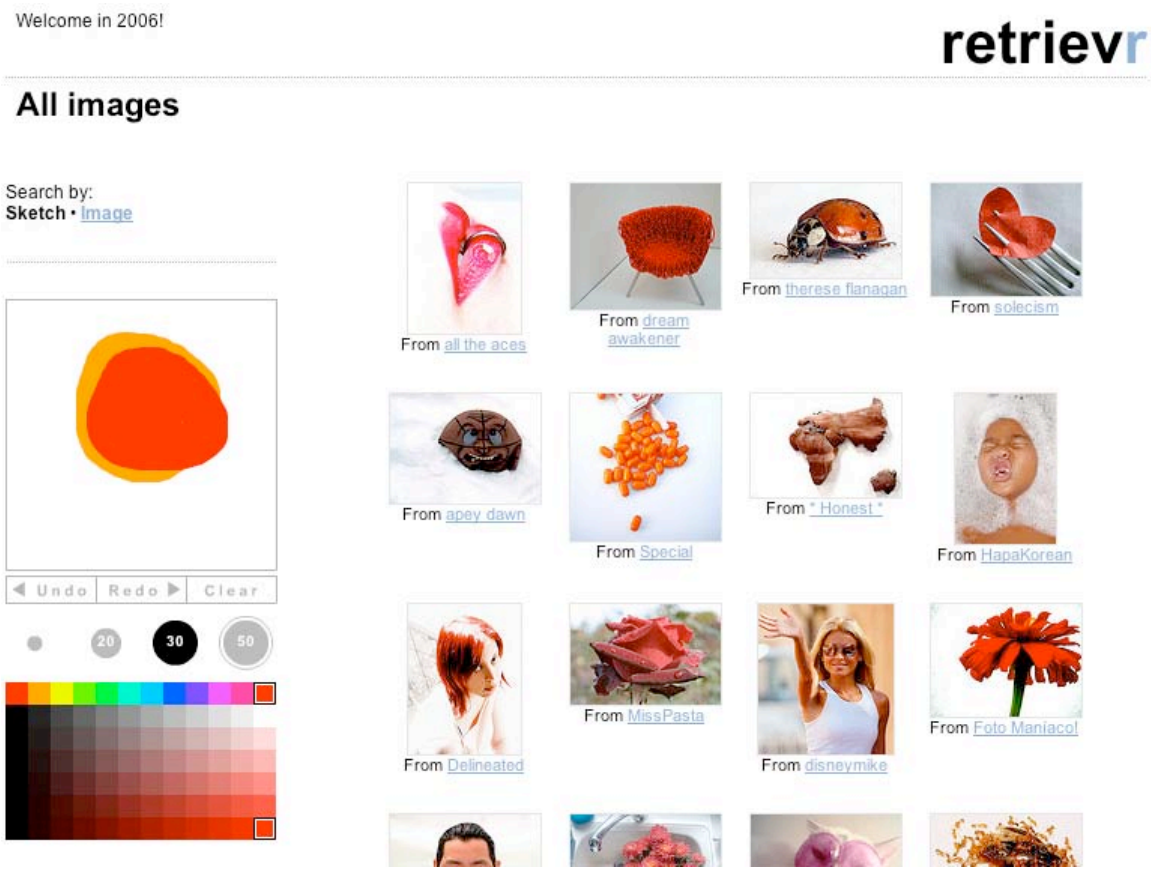


Fig. 5. Retrievr website showing sketch created by searcher and matching Flickr photos.

PEW Internet and American Life Project

The PEW Internet and American Life Project is an non-profit research group that produces comprehensive reports on the usage and impact of the internet on families, communities, work and home and daily life. It aims to be an authoritative source on the evolution of the Internet and how people interact online.

In its "*Content Creation Online*" report it found that **44%** of Internet users have created content for the online world through building or posting to Web sites, creating blogs, and sharing files (Lenheart, 2004). This report documents a substantial increase in users contributing content to websites. Rather than just passively reading online, users are actively engaging in creating and publishing content online.

In 2006 PEW release a report titled "*Browsing the Web for fun*" which documented how users on the Web spend their time. When users were asked "Do you ever go online for no particular reason, just for fun or to pass the time" **66%** of users answered yes. Overall **30%** of users indicated that they surf the web regularly just for fun (Fallows, 2006).

Summary

The imaginative reaction of the users to the Guide in the Apple project and the engagement with and pleasure derived from the agents in the experiments of Koda and Maes (2003) give us an insight into how agents might be used to motivate people. A sense of companionship and identification was felt with the agent as it acted on a user's behalf. This same engagement and empathy for the interface may be used not only to give the interface a sense of intelligence but to draw people into a more emotive and social relationship with the computer. If the computer interface is personified and becomes "someone" to collaborate with, the principles of common good and dramatic theory can be used to draw information out of the user. The growth of Web 2.0 websites shows a maturity of collaborative ideas within the web community and a willingness by users to engage directly with other users by contributing content. As users become more proficient at using increasingly complex online services they spend more time interacting with applications and developing ongoing relationships with services like Google.

Hypothesis

While there has not been a great deal of research into the specific application of personification and narrative frameworks to interface design there is broad evidence to suggest that such an approach may be an effective way to engage and motivate users. This research along with my own involvement and observation of the user behaviour in phase one of the Searchbots website suggests these are areas worth exploring and evaluating.

One of the key intentions of this project is to create a high level of engagement between a user and their Searchbot. This engagement should then lead to the establishment of an ongoing relationship between user and Searchbot, which can be leveraged to motivate and encourage the user to interact with their Searchbot. Users should then realise it is to their own advantage to maintain their Searchbot and contribute website metadata to the search engine.

Personification and narrative frameworks have been shown to increase the emotional engagement and fun users have when interacting with an on-screen avatar. I hope to test these effects by building a personified search agent interface that engages users over time thereby increasing the likelihood of metadata contribution. A search agent narrative will be built into the design and language used within the prototype to create a compelling illusion of artificial intelligence and personalized responses by the Searchbot.

The intended effect of this approach is the ongoing contribution of website metadata to the search engine by users as a personalised relationship between user and Searchbot is established.

The following sections document the building, testing and analysis of each step in the building and running of a Searchbot.

BUILDING THE PROTOTYPE

VISUALIZING SEARCH ACTIVITY, THE SEARCH ROBOTS

A key visual component of the website is the Searchbot itself. I commissioned an illustrator from Karactaz, based in Wellington, New Zealand, to produce two initial search agent designs with the intention of adding more Searchbots later. The brief for the search robots was that they appeal to a broad audience that included both genders. Aesthetically they needed to not be too geeky and high tech in appearance yet still look like robots. They needed a built-in character to attract people and provide a default personality with which users could quickly identify. I provided the illustrator with a number of reference images of robots and rendering styles that I felt captured the aesthetic and characterization I wanted to achieve in the prototype. (Fig. 6) As Koda and Maes (2003) pointed out in their interface trial, a cartoon-like character is more likable than a realistic human representation and I wanted to create a high level of engagement across a broad audience.

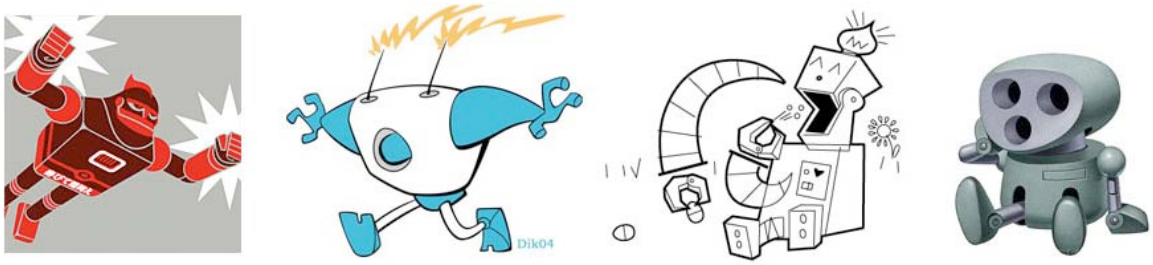


Fig. 6. Robot and rendering style reference provided to illustrator.

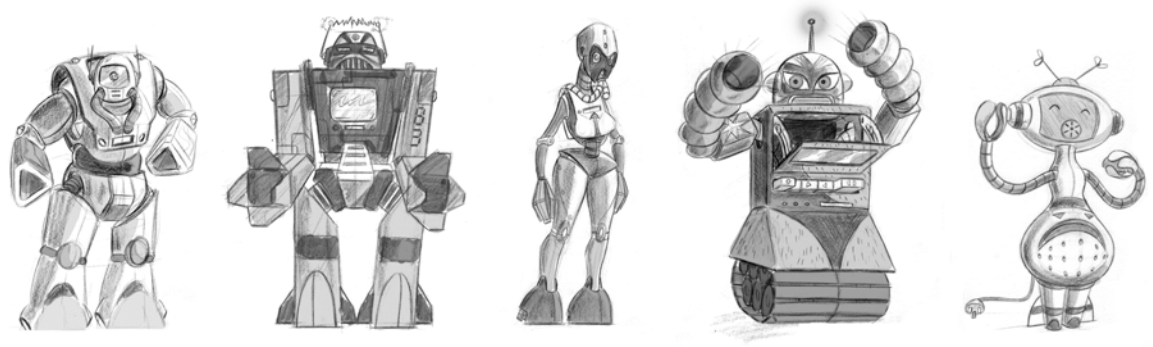


Fig. 7. Early Searchbot illustration iterations.

After we discussed the functions of the Searchbots website, intended audience and the idea of building a relationship with an online robot, the illustrator produced a number of

initial ideas for robots. (Fig. 7) Through a process of brainstorming and elimination we settled on two characters that had a lot of personality built into their visual representations. One is a female punk robot with a mixture of goth and punk accessories. Rather than maintain the stereotypical dark gothic colour palette, a default pink and blue colour scheme was used that lends it a feminine and "girly" appearance. She has large claws for grabbing the information she finds useful. The second character is a large male Mexican wrestling robot, wearing the traditional tights and masked hood, with a tape-deck in his chest and large vacuum tubes for arms that can suck in information.

These quirky characters and accessories humanize the robots and allow people to attribute personality to them. The border between dumb machine and artificially intelligent machine needed blurring so that users imagine their Searchbot as having thoughts of its own and enough self-determination to go off into the Internet and search intelligently on users' behalf.

Making the Searchbot character a prominent part of the search interface also highlights its relationship to contemporary computer game aesthetics. Many online role-playing websites like World of Warcraft or Second Life allow the user to select an avatar that represents them within the virtual environment. Users can then customize the avatar to represent different aspects of their personality. The avatar in a game environment represents the user's virtual actions and the status of their character's health is often reflected visually in the appearance of the character. The Searchbots prototype taps into this common game visualization technique and applies it to the reflection of the search activity of a user.

The use of a robot character establishes an ongoing narrative within the interface as the user first builds and then trains their Searchbot over time by interacting with it and feeding it information. The use of a character that the user can personalize and interact with increases empathy. The use of a rendered character or avatar is a common technique within computer game design and is known to increase the psychological proximity of the user to the character and narrative within the game (Garzotto, 2006). This empathy for the character is then leveraged to help motivate the user to contribute information and thereby keep their Searchbot alive.

Searchbots Characters

Fig. 8. The different modes of a Searchbot; receiving input, searching, broken

Each Searchbot has three different poses to reflect its current activity and health. (Fig. 8) The default pose is an upright standing pose. The user interacts with the Searchbot by selecting a function on the website (which is represented by a search chip) and then dragging it on top of the Searchbot. When the search chip is over top of the Searchbot a compartment in the chest opens and the user is able to drop the chip inside which then triggers the selected function.

When a user sends a Searchbot off to search on their behalf the character adopts a dynamic flying searching pose. A sense of movement is created by a cloud of icons flying past the Searchbot, each of which represent a popular website searched by the Searchbot. This pose helps establish the idea of the Searchbot as a superhero-like character with advanced and powerful abilities to search on behalf of the user.

The third pose is one in which the Searchbot is broken down and falling apart with oil leaking out of it. This pose is shown when the power level of the Searchbot drops too low and the user is not able to search any more. The emotive stance of this pose is designed to encourage the user to fix their Searchbot by feeding it information and making it healthy again.

This approach to designing the character's actions and emotive states rather than as a detailed static character is in line with one of Laurel's (1993) design principles, which encourages the design of actions rather than building objects and environments. The focus is on representing the actions of the user and encouraging them to perform tasks using visual triggers.

Building A Searchbot

The first process a user must go through before using a Searchbot is to build it. The prototype requires users to go through a number of steps to get their Searchbot up and running before searching.

Step One: Users are presented with a number of Searchbot components that they can drag onto a blank Searchbot template to build a Searchbot. They are able to mix and match the components to create their own personalised Searchbot. Before moving on users are asked to name their Searchbot.

Step Two: Users are able to customize the colours of their chosen Searchbot.

Step Three: Two personality chips are presented on screen and users are asked to drag one into the chest of their Searchbot. The personality chip influences how the Searchbot communicates with its owner and helps determine the language and tone used.

Step Four: Users are asked to build an artificial intelligence for their Searchbot by creating a tag cloud of topics about which they are knowledgeable. They will later be asked to help train their Searchbot on these topics and they will also be used to personalize the search results they receive.

Step Five: Finally the user is asked to enter some basic registration details like name, email and password. They also indicate if they are happy to be a part of this research project.

Using A Searchbot

Once a user has built a Searchbot they are presented with a control panel where they can perform various searches and tasks by programming their Searchbot with a search chip. To trigger a task users drag a search chip into the body of their Searchbot.

As well as a standard keyword or tag search the prototype provides a number of unique methods of searching. The user can use their Searchbot to search for websites using alternative metadata like colour, mood and location. For example when using the colour search chip users are able to select a colour from a broad palette. Their Searchbot then uses that colour to find websites that match the many associations a colour may have. Searching for the colour red might return websites about tomatoes, communism or anger management. The metadata that helps determine the search results for these alternative search methods is collected via metadata games the user plays when feeding their Searchbot. Users are also able to ask their Searchbot questions which are answered by other Searchbots and set up regular search reports tracking specific topics.

Tracking User Behaviour

Collecting statistics

A key part of any iterative design process is the review and testing of a single iteration. Assumptions about user behaviour need to be checked and matched to what is and isn't happening when a user encounters a design work. In the field of web application design we are fortunate to be able to track every aspect of a user's interaction with a web application. I took two approaches to collecting usage statistics for Searchbots. One was to use Google's Analytics service, which provides a good deal of basic usage information and goal tracking. The other approach was to build my own statistics that could be fine-tuned to observe the actions a specific Searchbot was performing, for example how often a particular Searchbot was reviewing the quality of a website or tagging a website with a colour.

Appendix III contains the login details for viewing Google Analytics for Searchbots online and a summary of the main statistics.

Profiling individual user behaviour

The Searchbots website is a dynamic database driven website. This means that not only are all the search results and user preferences stored in a database but also each interaction a user has with their Searchbot can be stored and reviewed. Collecting and analyzing specific user behaviour is an important part of the iterative process. As can be seen in the individual Searchbot report (Fig. 9) I was able to build reports that drill down through the data to a specific individual's actions and search history. This detailed history of an individual's actions can then be compared to larger assumptions made about user behaviour from analyzing overall statistics from the website. This also allows me to examine a user's motivation levels from a quantitative perspective and match them to responses from the user survey.

Fig. 9 shows the history of an individual Searchbot. The top sections show the number of visits made and the timeframe within which they have been made. The 'questions' this Searchbot has been asked are listed next, followed by any 'topic reports' the Searchbot is searching for on a weekly basis. The 'website quality' shows the websites that the user

has visited and then rated followed by any colours the user has added to websites while feeding their Searchbot and finally a full list of each website the user has visited.

Searchbots.net Stats

Barney owned by Neil

16 visits, last visit 146 days ago on 2007-05-21 21:58:14
bot made 170 days ago on 2007-04-27 16:34:02

0 questions asked by other searchbots and **0** questions answered.

questions
Have there been father & son popes?

report
hindi pop 3

website quality
74 The New Media Journal | The Anti-Google Search Engine Index
80 Intelligent design movement - Wikipedia, the free encyclopedia
100 natural history magazine
0 paysite passes
51 Intelligent Design
35 2g iPod Shuffle Contains a Major Defect!!!
53 ColorJack: Studio (beta)
90 Simpsons - The Myth of Creation

colours added
2007-04-27 16:44:19 Intelligent Design

websites visited
2007-07-01 22:42:41 Overwhelming Evidence
2007-06-14 21:52:40 RichardDawkins.net - The Official Richard Dawkins Website
2007-06-14 21:36:03 Atheism and the Scientific Community
2007-06-14 21:25:02 The New Media Journal | The Anti-Google Search Engine Index
2007-05-30 22:22:03 Evolution for Creationists
2007-05-21 21:33:34 Discovery Institute
2007-04-30 23:41:51 Best of Hindi pop albums
2007-04-30 23:01:03 A1 Bollywood Hindi Tamil Telugu Indian Music Videos Songs Soundtracks Movie Film and News -
2007-04-27 21:22:42 Intelligent design movement - Wikipedia, the free encyclopedia
2007-04-27 21:20:52 natural history magazine
2007-04-27 21:20:03 Viori Gliga - Viori,viole,contrabasi,violoncei,instrumente,arcuse,accesorii,gama,gems,genial, viori
2007-04-27 21:19:32 paysite passes
2007-04-27 21:18:53 Intelligent Design
2007-04-27 21:17:18 2g iPod Shuffle Contains a Major Defect!!!
2007-04-27 21:16:31 ColorJack: Studio (beta)
2007-04-27 16:44:19 Intelligent Design
2007-04-27 16:42:36 Intelligent Design The Future
2007-04-27 16:40:46 Intelligent Design Theory and Neocreationism (Skeptical Inquirer September 2001)
2007-04-27 16:36:27 Simpsons - The Myth of Creation

Fig. 9. History of individual Searchbot

Usage Statistics

In the review period **6000+** Searchbots were built.

Overall **33%** of users that built a Searchbot returned to the website at least once.

Many people try out a website once and never return. In order to understand the actions that people took over a period of time and a number of encounters with their Searchbot I've filtered the rest of the statistics below. All the following statistics in this section are for people that built a Searchbot and then returned to the website at least another two times. As can be seen from the average number of visits, these are people who visited Searchbots on a regular basis for a period of time. In the course of interacting with their Searchbot they would have had to feed it information to keep it alive. Filtering the results provides a much clearer picture of the users' interaction over time.

17% of users returned to the website more than twice.

Of those 17% of users…

The average number of visits was **9.5**.

They visited an average of **9** websites each.

The average power level of their Searchbot was **92%**. Through visiting websites these Searchbots experienced an average power drop of **46%** and then through being fed information by their users gained an average **38%** boost in power. See p. 37 for description of the power level process.

54% of people rated the quality of at least one website.

Of the **54%** of people rating a website each user went on to rate an average of **6** websites.

User Survey

In conjunction with the quantitative statistics provided by Google Analytics and the built-in tracking of users, I also found it vital to survey users directly. It is otherwise very difficult to interpret the intentions behind a particular action a user has taken. The survey, which included questions about the motivation felt during different stages of the relationship a user has with their Searchbot, provided valuable feedback and insight not gained by statistics alone.

Surveys provide opportunities to collect a wealth of information about users. Once people decide they are happy to participate and complete a 10-15 minute survey then a number of questions can be asked. I designed a survey that moved through a range of topics: demographics, search tools used, how they found the Searchbots website, what they expected from their Searchbot, the process of building a Searchbot, how motivated they felt to contribute information and other general feedback.

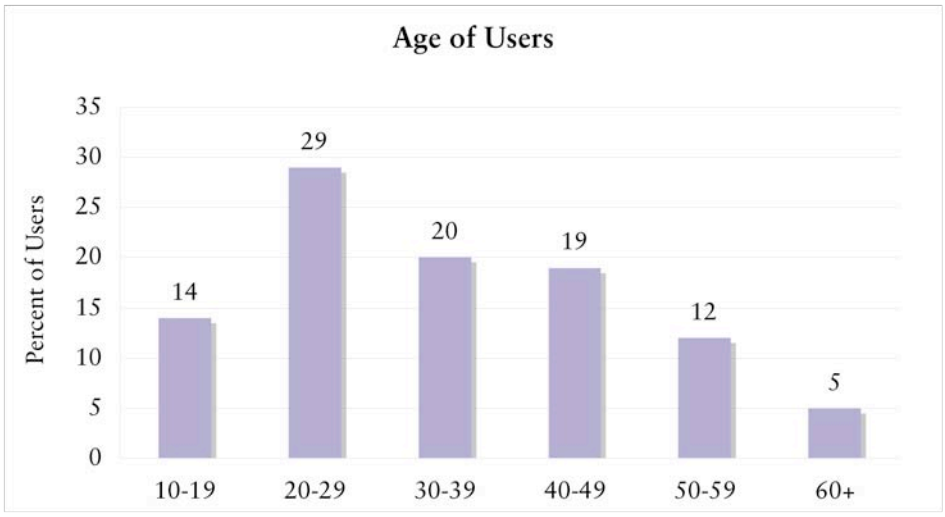
The design of the survey encouraged users to reflect on how they employed search tools on the web and then to document their experiences of using a Searchbot. In particular I was interested in capturing the users' first impressions of the search agent concept and then comparing how well Searchbots delivered on the promises made by the homepage. Nested within this framework were specific questions about particular points in the Searchbots relationship when users were asked by their Searchbot to answer a question or rate the quality of a website. These questions focused on how motivated a user felt to contribute information and, combined with quantitative statistics, provided an in-depth view of the user's actions and motivations within the Searchbots prototype.

In order to determine users' attitudes or feelings about their Searchbot a mixture of Likert-scale and open-ended questions were asked. The Likert-scale questions contained 10 steps and for the motivation-based questions used a range between "Not Motivated" and "Very Motivated".

See Appendix II for the full survey results.

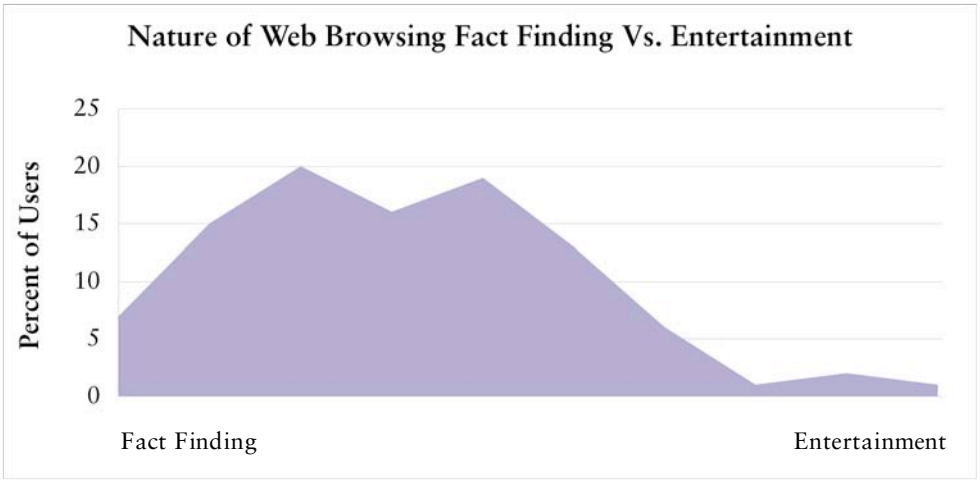
Survey Demographics

Below are some of the demographics and behaviours of the Searchbots users who chose to complete the user survey. **302** users completed the survey, which is **10%** of the users who indicated they were happy to take part in the research project.



82% of users are male. The majority are **20-29** years of age with the remainder of users fairly evenly split between the rest of the age groups.

Users spent an average of **3.7** hours per day browsing the web. Of that time users reported that they spent **1** hour using search tools. **89%** of users stated Google was their main search tool.



The majority of users were using the Internet for fact finding rather than entertainment.

These findings show that the majority of users spent their time looking at familiar websites rather than browsing new unfamiliar websites.

The open-ended and motivational questions have been combined with quantitative statistics and are discussed in the following sections.

Building a Searchbot

One of the key features of Google Analytics is the ability to define goals within a website. A goal is reached after a number of steps or actions have been performed on a website. The ability to determine that a goal within a website has been reached was perfect for determining how many people visiting the Searchbots homepage ended up making their own Searchbot. It also shows the step in the process at which they gave up and moved to other parts of the website. Tracking this conversion rate of anonymous visitors into Searchbot owners helps show how effectively the homepage design is communicating to users.

The key communication goal of the homepage was to promote the idea of building and owning a search agent and the unique features each Searchbot offered, such as searching for websites via colour or other metadata types, and the ability to create custom reports. For several reasons the website deliberately forces people to go through the process of building a Searchbot rather than giving users a demo Searchbot to experiment with. Although it creates a barrier to quick search results I wanted people to spend time up front building and personalizing a Searchbot. My hope was that forcing users to build a Searchbot first would lead them to have a greater sense of attachment and empathy for their character. The building process is also a key part of establishing the website's search agent narrative.

Further on in the process a Searchbot may ask questions, or if it's neglected it will run out of power and break down. Creating a stronger relationship on first visiting the website might lead to a more motivated response to these events based on the initial time and emotion invested. The time and steps involved could also help reinforce the concept and mythology that the Searchbot is an actual intelligent search agent. As Laurel (1993, p. 147) witnessed in the Apple Guides project, when users are presented with a character as part of introducing an interface they readily adopt the character as a collaborator and engagement is increased.

For this reason I thought it was important that users go through the same attachment process and establish a narrative associated with owning a Searchbot. This allows the

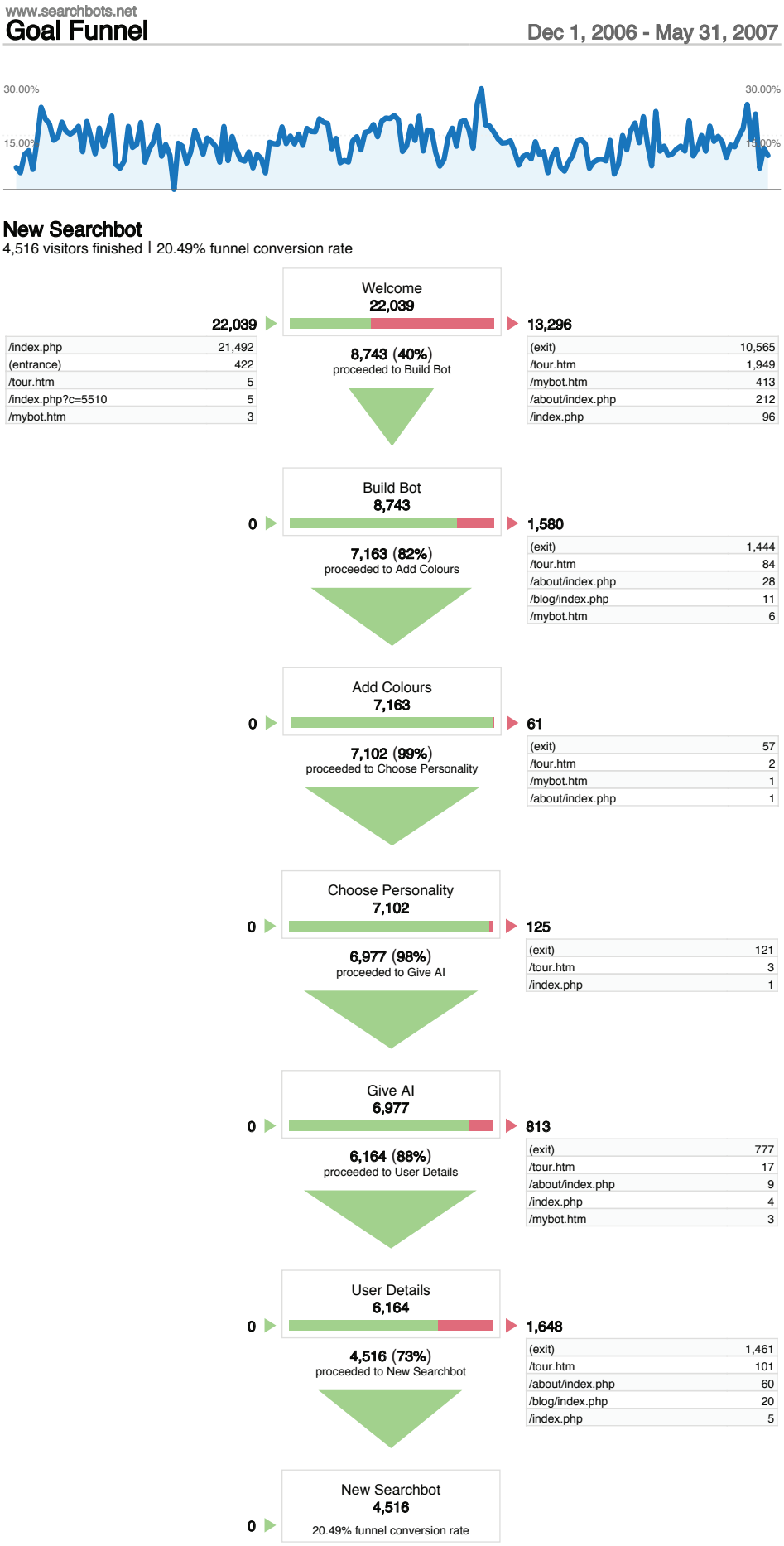


Fig. 10. Google Analytics Goal Funnel for Building a Searchbot

user to imagine what the Searchbot might be able to do for them before they actually start using it. Once users start searching with their Searchbot it operates quite differently to the search results received from popular search engines like Google and encourages people to build up a relationship with their Searchbot over time. While a user's Searchbot gives them immediate search results it also personalizes itself over time based on the feedback given by the user. This approach leverages the ongoing relationship users develop with a search engine. Users often search for information several times a day and visit the same search engine day after day. Rather than treat each search the users does as a single isolated experience a user's Searchbot attempts to leverage the regular visits a user makes over time. This approach to building up a user relationship that is then used to personalise the user experience and content is commonly used by Web 2.0 websites like Amazon. The website essentially learns about its users over time and is then able to respond to them individually.

To help establish this relationship over time and increase the motivation levels of the user I created an interface experience in which users can suspend their disbelief and engage with their Searchbot, not as a piece of software but as something anthropomorphic and emotionally engaging. It becomes a virtual pet with intelligence; a collaborator in the user's ongoing search for information. This sense of attachment can be seen in responses to the survey when users were asked to describe their interaction with their Searchbot.

> "Since I selected its colours and it was modelled after a person, it was like having more company with me while I searched the net. Yeah, a Searchbot is way cool!!! I can sometimes get lonely searching the net, but, I feel like I have some company with her" (Survey respondent).

The Google analytics "New Searchbot" goal funnel (Fig.10) provides a breakdown of each step the user has to go through to build their Searchbot. It shows the percentage of people that move from one step to another and the point at which a user decided to stop building a Searchbot is clearly identified. As users exit the funnel at a particular step we can see if they leave the website altogether or go to another section looking for help.

40% of people visiting the "Welcome" homepage clicked on "Start building your Searchbot now!". Throughout the rest of the building process a further **20%** of the

original homepage visitors decided not to continue. This resulted in an overall conversion rate of **20%** of homepage visitors who completed the process of building a new Searchbot.

To put this **20%** overall conversion rate in context, the average conversion rate for website services and product trials is between **8** and **10%** (Ammirati, 2007). The number of users deciding they want to own a Searchbot is, therefore, twice the average conversion rate. This suggests that the homepage is communicating effectively and that visitors are motivated by the concept of owning a search agent.

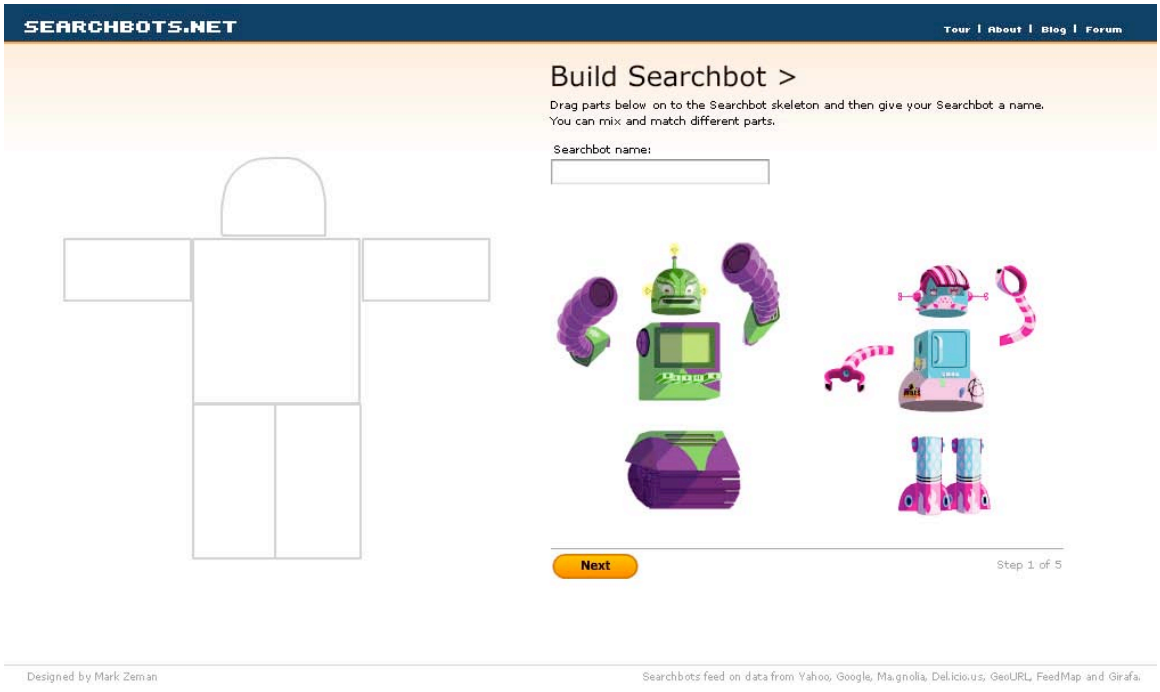


Fig. 11. Build Searchbot parts

There are two main points in the building process where users leave, thereby halving the number of possible conversions. The first point (Fig. 11) is at the start of the building process where they are asked to put together a Searchbot from individual components. Recent eye tracking studies show that website visitors often decide in the first 4 seconds whether to continue using a website or not (Akamai, 2006). This survey showed that users have a very low tolerance for slow loading pages, confusing design and poor usability, all of which can lead to a shortened attention span.

The key call to action on the Searchbots homepage is to start building a Searchbot. If a visitor to the website only takes a few seconds to look around the homepage and then

clicks on the build button, they are taken straight to the first step in the building process. Having skipped the details on the homepage these people might think that the process looks too game-like and that this is not in fact a serious search tool. The page also indicates that there are 5 steps to go through and some people may consider that too many to simply try out a website.

In the next iteration of the prototype adding another page in between the homepage and the start of the building process might change both of these reactions. This new page would address these issues by thanking visitors to the page for their interest and providing an overview of the steps involved in building a Searchbot. It would also introduce the game-like nature of owning a Searchbot and show how their feedback will contribute to the overall intelligence of their search agent. The tone and language used would be encouraging with visuals to show how simple and interactive each step is. The page would also provide an opportunity to reinforce the benefits of owning a Searchbot in case that user had not taken the time to read the background details on the homepage.

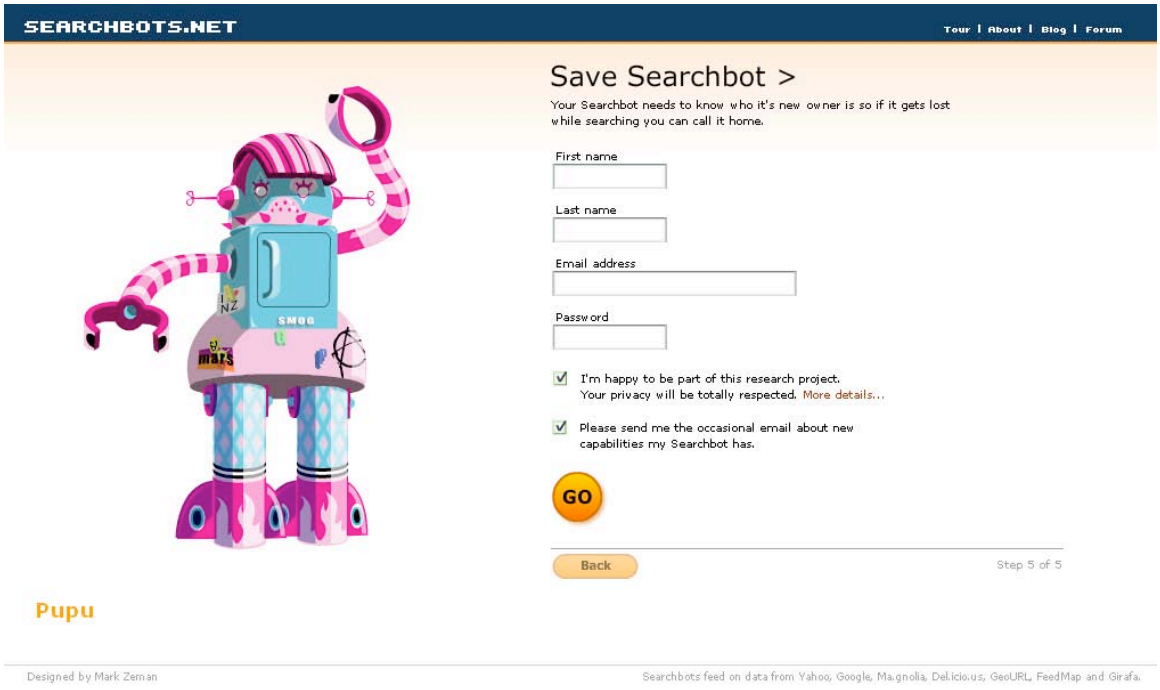


Fig. 12. Build Searchbot User Details

The second and largest drop-off in the building process is the last step, which asks the user for personal details so the Searchbot can be saved and then retrieved if lost (Fig. 12). Privacy is a major concern for a lot of search engine users and many people are not

willing to share personal details for fear that their search terms may be exploited for marketing or law enforcement purposes. The PEW Internet & American Life Project report into search engine users found that "21% of all internet users would stop using a particular search engine if they learned their searches were being tracked" (Fallows, 2005, p. 21). As this is the step with the largest drop-off in users it is crucial that the principle of protecting the user's privacy be made obvious. In the next iteration of the prototype reducing the amount of information required to the bare minimum and only asking for a username and password should help the user feel more secure. Privacy policy information should be brought to the forefront and users assured that their details and searches are kept private.

Other information such as the user's first name, email, research participation and email settings could all be asked by the Searchbot as they interact with it over time. The questions could be asked directly by the Searchbot in a conversational manner and be linked to the specific benefits of sharing those details. For example a Searchbot may ask a user for an email address when they build a report, the reason being to allow a weekly email report to be sent. This way the revealing of information is user-driven rather than the website appearing to demand details before the user is allowed to proceed. The language and tone used is very important in these steps and an overall sense of trust and a permission based relationship established.

Considering that **27%** decide not proceed past this step and that around **20%** of people would stop using a search engine if they knew it tracked them, it's fair to assume that there will always be a significant drop in this part of the process.

Overall the high conversion rate of website visitors into Searchbot owners shows that the message is being communicated effectively and visitors are genuinely enthused by the prospect of owning a search agent that can work on their behalf.

Motivating users to feed their Searchbot

The key premise of the website is that the user establishes a relationship with their Searchbot over time and is encouraged to contribute metadata about websites. Tapping into a game-like approach I decided to give each Searchbot a limited amount of power. Each Searchbot has a power level indicator and as the user searches and visits websites the power level drops. (Fig. 13) As the power level drops it changes colour and if a

Searchbot is not fed information it eventually breaks down and the user is not able to continue searching. (Fig. 8) To keep a Searchbot alive the user must interact with it by rating the quality of a website or adding metadata. This could be for example colour, mood or keywords associated with a website.

Fig. 13. Searchbot power level indicator.

The power level of a Searchbot is the key indicator of how much a user has interacted with it. Every time an external website is visited the Searchbot's power level drops by **5%**. Upon returning to the search results users are randomly asked to rate the quality of the website from which they have just returned. Rating the quality of a website boosts the Searchbot's power level by **5%**, keeping it constant if the user visits a website and then rates it.

Users also have the option of visiting a "feed me" section of the prototype where they can add unique metadata about the last search result they visited. One of these feed options allows users to make associations between colours and the content of a website: for example, websites about communism or anger management might be red. A person playing these metadata games allows Searchbots to offer more creative ways of searching the web through options like a colour search. Feeding a Searchbot information by playing these metadata games boosts the power level of a Searchbot by **25%**, rewarding the extra effort required to add these details.

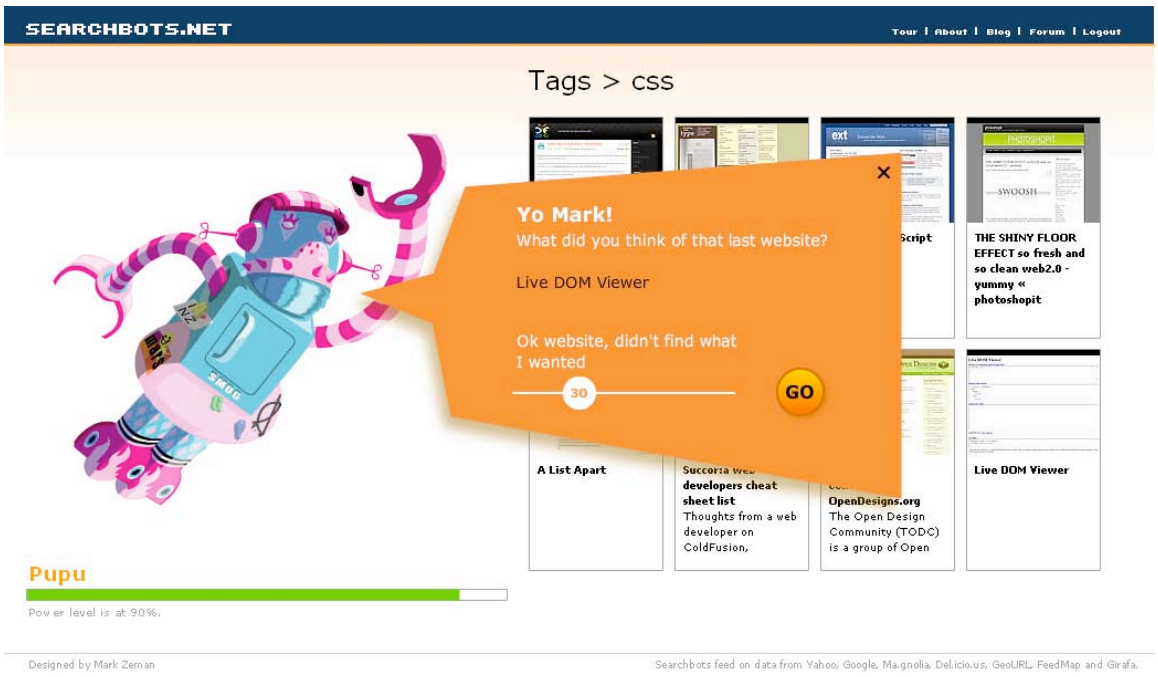


Fig. 14. Searchbot asking user to rate the quality of a website.

Many websites ask users to review the quality of products or services by providing a five star rating widget for users to provide feedback. This step is usually optional and users can easily ignore the request to rate a product or service. As soliciting feedback from users is so crucial to Searchbots I decided to actively interrupt the user on their return from viewing a search result. When a user clicks on a search result they are sent to view the website in a new browser window and the Searchbot randomly (a one in three chance) pops up a message over the search results (Fig. 14).

Once the user returns to Searchbots they must either close the message or rate the website they've just seen to view more of the search results. Rating the quality of a website also increases the power level of a Searchbot. The quality rating popup is designed as a speech bubble so it appears the Searchbot is directly asking the user a question. The speech bubble also covers the search results, forcing users to provide feedback or actively close the speech bubble before they can continue browsing the results. The language used in the speech bubble is personalized and informal leading to a casual and friendly tone. These design elements deliberately leverage the relationship that has been established between the user and their Searchbot. The overall effect is that users are encouraged to "talk" to their friendly Searchbot and therefore feel like they are engaging with it and continuously improving the quality of the relationship and search results.

Users' Searchbots didn't power down nearly as quickly as expected and less than **1%** of Searchbots ever broke down because the power level was below **10%**. When the prototype website was first launched, rating the quality of a website increased the power level of a Searchbot by **10%**. I anticipated users would visit many more websites than they rated. The **10%** power boost was there to act as an incentive and keep the Searchbot from dying. After a number of Searchbots had been built and used for a few weeks it was clear that the average health level was very high. Users were contributing more than I expected and keeping their Searchbots very healthy. In a subsequent iteration I dropped the power boost awarded for rating websites to **5%** to lower the average health level and provide more incentive to feed the Searchbot as the user watched the power level drop.

Users made comments in the survey about wanting to be able to rate the quality of every website they visited rather than the random sample I provided.

> "I really think to get more information out there faster, our bots should ask us more questions, and they're really not that difficult or annoying to answer." (Survey respondent)

There was also a mixture of responses towards the concept of a power level and compulsory feeding of the Searchbot. Some people didn't like the game-like nature of the activity and felt coerced into providing information.

> "I did it, but mainly because I thought it might improve my search results in the future." (Survey respondent)

Other people contributed information but only because they realized it was crucial to keeping the Searchbot functioning and improve the search results.

> "I know I'm being mean-spirited, but why spend my time making other people's experience better?" (Survey respondent)

A number of people said they loved the game-like nature and wanted to spend all day feeding and improving their Searchbot.

> "It keeps my bot fed. I like to feed it so it can become better in time. If there were 48 hours in a day I would be much happier." (Survey respondent)

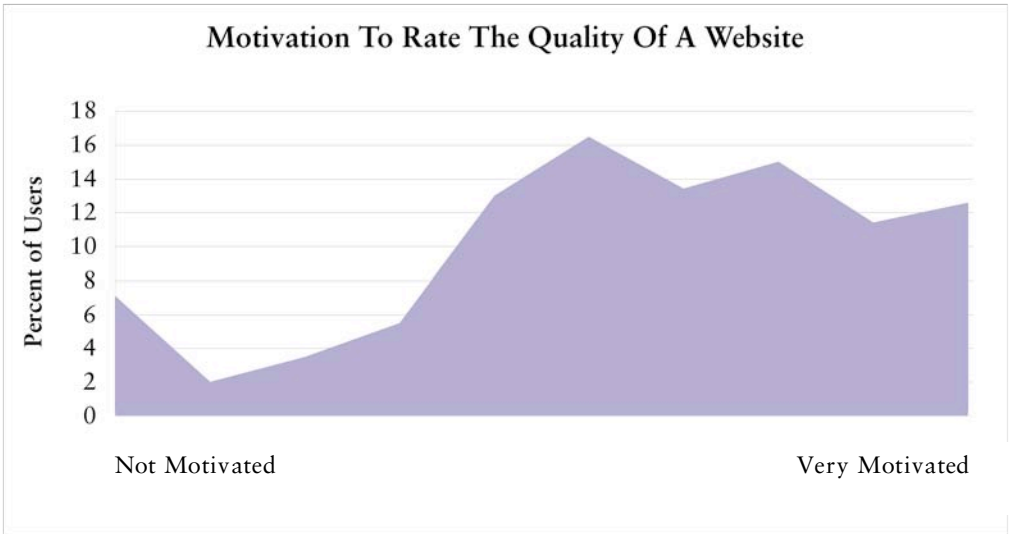
Overall, when asked to rate a website, **70%** of the time people did so.

This result is considerably higher than anticipated and therefore the power level of users' Searchbots did not drop as quickly as expected. The goal of the power bar is to visualize the activity of the Searchbot and encourage the user to contribute metadata about websites. By contributing metadata they're feeding their Searchbot, keeping it alive and increasing its artificial intelligence.

74% of people believed that the quality of the search results improved, the more they fed their Searchbot.

The survey statistics indicated that part of the reason users are so keen to interact with their Searchbot and feed it metadata was the powerful belief that the more information they give their Searchbot the smarter it would become and the better the search results it would provide.

Even though the Searchbots website collects extensive information about a user's interactions with their Searchbot the information is not currently used to refine or personalize an individual's search results. Rating the quality of a website is averaged amongst users and then affects the ordering of search results retrieved from Google and Yahoo. This average score is shared among all the users of Searchbots and is not a personalized result. This assumption that the results are improving can therefore only be attributed to the interface and the personified search agent. As can be seen in the survey responses, users believe that the Searchbot is learning and responding to their input. This belief increases the users' motivation levels and increases the amount of information they contribute.

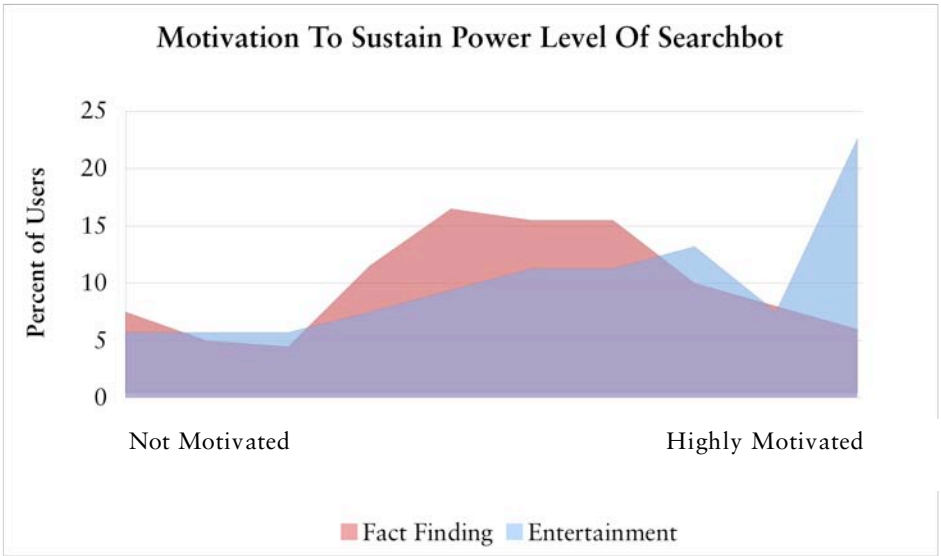


Users were surveyed about their motivation levels when presented with the "rate a website" message from their Searchbot. On a Likert-scale of "Not Motivated" to "Very Motivated" users responded with a significant weighting towards "Very Motivated". Clearly users are motivated by the design and website concept to contribute information to the search engine.

Fact Finding Vs. Entertainment

At the start of the survey users were asked to define the nature of their web browsing. They were asked to choose a proportion between "fact finding" and "entertainment." The searching mode of these two types of searchers is quite different and reflects a different attitude to the function of the web and search tools. The subsequent motivational questions within the survey can be broken down by the two categories to reveal differences in response to the game-like strategies and interaction encouraged by the Searchbots prototype.

During the user survey, users were asked to rate how motivated they felt to sustain their Searchbot's power level. Users responded via a Likert scale between "Not Motivated" and "Highly Motivated".



The graph above is split between people who spent the majority of their time on the web "fact finding" and those looking for "entertainment." People looking for entertainment were much younger than the fact finders with **39%** of them being in the 10-19 age group; whereas the majority of the fact finders were older with **28%** in the 20-29 age group and **23%** in the 30-39 age group. The former users are more likely to be computer role playing game players and therefore are more familiar with the game-like power level model used within Searchbots to motivate users. Results show that a greater number of users who spent most of their time searching for entertainment were more motivated to maintain the power level of their Searchbot than people using search tools to find facts.

Search Results

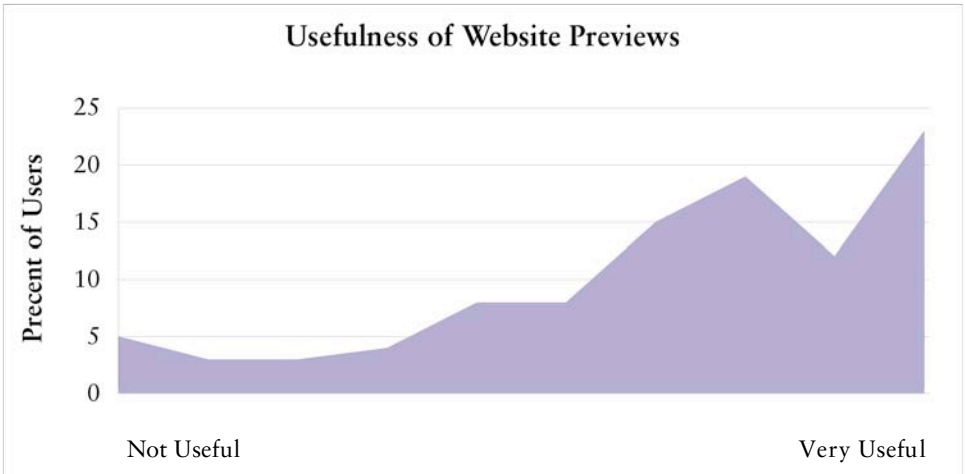
Obviously a search engine like Searchbots is judged largely on the quality of its search results. As developing a unique search approach and algorithm like Google's Page Rank to power Searchbot is outside the scope of this prototype, I took a different approach to providing quality search results to users.

One of the defining characteristics of recent Web 2.0 websites is that they allow access to their databases and content via an Application Programming Interface (API). This allows third party developers to build their own interfaces to existing information stored in the databases of high profile websites. These databases have traditionally been locked away and treated as proprietary information. With more and more of the content constituting a website now being submitted by its users, Web 2.0 websites are now

acknowledging that those same users have the right to freely access the combined sum of their contributions.

Searchbots relies on these Web 2.0 API's to populate its initial set of search results for any given keyword used in the tag search chip. The search results displayed are a combination of results drawn from social news website Digg.com and social bookmarking website del.icio.us. The results from these popular websites are then combined with results from the Google and Yahoo search engines and finally filtered by the website quality ratings contributed by Searchbot users. Once a website has been visited via the tag search chip it becomes available within Searchbots for various other metadata games, like adding a colour, mood or location - which are ways of searching unique to Searchbots.

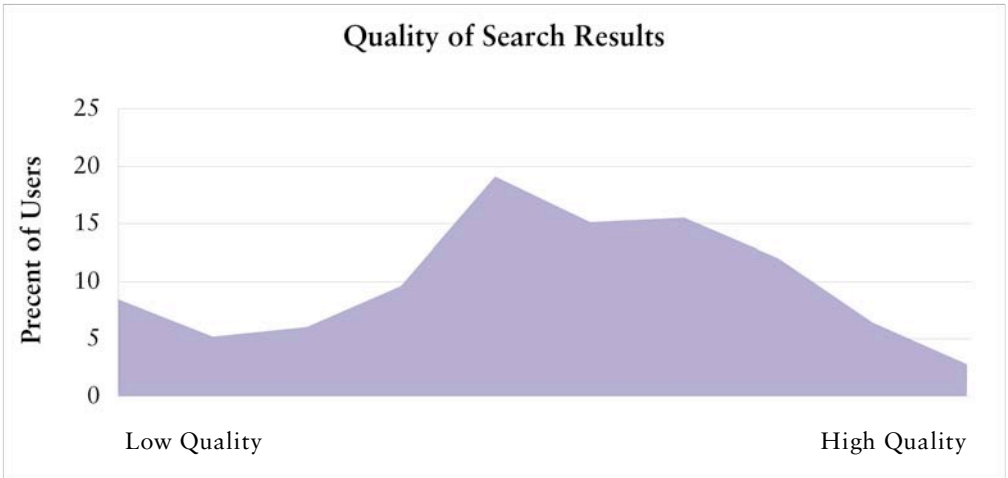
As part of the Searchbots prototype I also developed a custom built screen shot engine that turns web pages into small image previews that can be displayed alongside each search result. The website preview gives users a visual cue to the quality of a website by judging its overall design and use of colours and photography. The preview also increases recall as users recognize the website's overall design if they have previously visited the website (Czerwinski, 1999). As can be seen in the following graph of survey responses to the usefulness of the website previews there was very strong support for their use with the highest percentage of users (**23%**) indicating they were very useful.



After initial enthusiasm for the search agent concept the mixed quality of the search results saw a drop-off of people using their Searchbots. There is also a great deal of loyalty built up around search engines as they are the main way people interact with the

internet and are often the first website people visit at the start of each session. Complete Inc., an online market research firm that tracks user behaviour, reported that **71%** of users who use the Google search engine only search at Google and don't use other search engines (Complete, 2006).

While this project has focused on evaluating an interface prototype it is hard to get a full picture of the user experience without also developing a comprehensive search algorithm that delivers on the expectations created by the search agent promise. Therefore only indicative conclusions can be drawn about the overall effectiveness of the website as the interface and search results are combined into one user experience that the users reflect on as a whole.



Further iterations of the interface prototype need significant research development put into the underlying search results filtering process within Searchbots. This would lead to an improvement in the search experience for users and improve retention and loyalty among users who have built a Searchbot.

User Comments & Feedback

A number of open-ended questions were asked as part of the user survey. These questions encouraged users to reflect on the act of owning and maintaining a Searchbot over time. The comments reveal that users are quite polarized by the personification of the interface and the need to feed their Searchbot. Some users felt the character was a distraction and that they were coerced into feeding and interacting with their Searchbot.

> I think the conceit has been taken a little farther than its utility. Anthropomorphizing search tools is pretty lame. I need it to work, not entertain me. (Survey Respondent)

Some users realised there was trade-off between answering questions and getting refined search results. Their comments indicate that they saw the search character as superfluous and that they implicitly understood the reciprocal relationship required for the search engine to function without a robot telling them what to do.

> If my bot were to continue to ask me questions I would feel obligated to answer. It would seem to me that my fictitious and loyal little bot would scour the entire net for me while I was safe in my bed. I would return its loyalty by answering a few measly questions. (Survey Respondent)

At the other end of the spectrum a number of users appeared to suspend their disbelief and really engage with their Searchbot, interacting with it as if it were intelligent and sentient.

> I am always glad to see my Searchbot! Pride of ownership is immediate and hoping to help a smart dude kicks in next. Perfectly motivated. (Survey Respondent)

> The Searchbot becomes a virtual pet. It's a motivation that makes me want to check on it from time to time and even show it off. (Survey Respondent)

> More responsive than most people I interact with. (Survey Respondent)

> My Searchbot recently contacted me with a question. "When you built my brain you said you could help me out if I got confused" he pleaded. He then asked me "How do I incorporate a business?" I don't know, so I didn't answer. I feel kind of bad, he's out there on his own and he's awfully confused. The responsibility is all too much. I would like to delete my account, but is that murder? (Website Comment)

It is hard to quantify open-ended responses but it's fair to say there is a clear division between those people whose imagination was activated by the idea of owning an intelligent search agent and those who perceived the characters as being an unnecessary veneer, distracting them away from the real task of searching for facts.

On the whole users expected more from their Searchbots and felt the search results didn't live up to the promise of an intelligent search agent. Users expressed a strong desire to own a search agent and many wrote about their Searchbot being a helpful friend or pet fetching them information. It appears there is a niche audience that responds well to the Searchbots concept and are willing to invest time and effort building and nurturing an ongoing relationship with their search agent.

The questions asked in the user survey can be found in Apendix II and all the responses to the open-ended questions made by users are available on the CD-ROM attached to the back cover.

Conclusions

Where to from here, the next iteration

Based on the feedback from the survey and website usage statistics it's clear that there are a number of interface improvements that can be made to the initial prototype. The nature of web application development and any iterative design process is that it can always be improved, tested and refined.

One of the aims of this project was to create a search engine which relies on users submitting information about websites to improve the quality of the search results. As this is a significant indicator of the success of the search engine it became a key part of the design concept. Both the user statistics showing significant ongoing metadata contribution by users who interacted with their Searchbot more than three times and the positive comments made in the users survey demonstrate that users were effectively engaged by the interface prototype.

Based on the behaviour observed in the first version of Searchbots the personification of a search agent was chosen as a means of establishing an ongoing relationship with a user. Search characters, or 'Searchbots' were created to visually represent the user's actions and relationship over time with the search results. Through the feedback received in the survey the use of personified search characters was shown to be an effective interface metaphor for encouraging empathy among users and increasing their engagement levels.

The use of a search character as part of an overall narrative nurtured an ongoing relationship between the user and their Searchbot. Users felt a sense of attachment to their Searchbot and when it started to power down they felt motivated to feed it information and thereby keep it alive. The usage statistics and survey responses demonstrated enthusiasm for the search agent concept and a motivation to engage with the Searchbot over time and to contribute information to the open content search engine.

The interface itself can be shown to have a direct influence over the motivational levels of users. Users contributed a significant amount of information to the search engine

through rating the quality of websites and playing other metadata games to keep their Searchbot alive.

To really deliver on the promise Searchbots makes of owning a search agent that can autonomously search on the user's behalf, both the interface and the search results need to work together in an integrated fashion. Although it is outside the scope of this prototype to focus on strategies for returning effective search results, the use of Web 2.0 API's worked well for users searching through using the more popular keywords. To fully measure the effectiveness of the search agent concept, another iteration which focuses both on interface refinements and the way search results are collated and delivered over time is required.

With further refinement of the interface and development of a more sophisticated search result strategy, an effective agent-based search engine may evolve. Even though the results of this prototype evaluation cannot be called conclusive there is evidence to suggest that for the goals of this particular interface the use of personification and narrative clearly increased the engagement users had with their Searchbot.

While the personification of the interface tended to polarise users a number also expressed excitement at the prospect of owning a Searchbot and put considerable time and effort into developing the perceived intelligence of their search agent. I see great potential in this project and as the Internet develops there are rich opportunities for alternative search interfaces that help reveal the wealth of human knowledge and experience now available on the Internet.

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Glossary

The Semantic Web

"The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation." -- Tim Berners-Lee, James Hendler, Ora Lassila, The Semantic Web, Scientific American, May 2001.
http://www.w3.org/2001/sw/

Wikipedia

Open content, coined by analogy with open source, describes any kind of creative work (for example, articles, pictures, audio, video, etc.) that is published under a non-restrictive copyright license and format that explicitly allows the copying of the information. (An example is the GNU Free Documentation License, which is used by Wikipedia and Nupedia.) "Open content" is also sometimes used to describe content that can be modified by anyone. Of course, this is not without prior review by other participating parties--but there is no closed group like a commercial encyclopedia publisher which is responsible for all the editing.
http://www.wikipedia.com

Bittorrent

The BitTorrent file distribution system uses tit-for-tat as a method of seeking pareto efficiency. It achieves a higher level of robustness and resource utilization than any currently known cooperative technique.
http://bitconjurer.org/BitTorrent/

Web 2.0

A phrase coined by O'Reilly Media in 2003 (and later popularized by the first Web 2.0 conference in 2004) in reference to a perceived second generation of web-based communities and hosted services - such as social-networking sites, wikis and folksonomies — which facilitate collaboration and sharing between users. O'Reilly Media titled a series of conferences around the phrase, and it has since become widely adopted.

Likert scale

A Likert scale (pronounced 'lick-urt') is a type of psychometric response scale often used in questionnaires, and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement. The scale is named after Rensis Likert, who published a report describing its use (Likert, 1932).

Appendix I: Searchbots.net Copyright Declaration

Mark Zeman, as owner of the website and domain name Searchbots.net, grants Massey University access to the following for the duration of the Masters in Design research project of Mark Zeman, a staff member of Massey University:

1. Existing user database in order to email invitations to partake in the proposed research.
2. Use of the domain name "searchbots.net" for hosting and testing prototypes.
3. Access to the Searchbots.net database.

The following will remain the sole intellectual property of Mark Zeman as owner of Searchbots.net:

1. All original and existing designs, code and databases.
2. Any changes to the Searchbots.net database and html coding required to run the interface trials.
3. Any data or metadata generated and added to the Searchbots.net database by participants in the research.
4. The data of any members who join the Searchbot.net website during the course of the interface trials - both those involved and not involved in the trials.

Mark Zeman, as owner of Searchbots.net.
24/5/2004

Appendix II: User Survey Results

The full results of the user survey can be viewed online. The CD-ROM in the back cover contains a web page with links to the survey results.

Once on the Survey Monkey website filters can be applied to view the results broken down by various demographics and survey responses. For example a filter of male or female can be applied. During the survey users were also asked to indicate if they spent the majority of their time on the web fact finding or looking for entertainment. A filter can be applied to the search results to see the difference in responses between those people whose main activity on the web is fact finding or looking for entertainment.

Feel free to add new filters to the survey results.

A summary of the survey questions and results follow. Full responses to the open ended questions can be found on the attached CD-ROM or viewed online.

Searchbots Survey

1. Your gender

	Response Percent	Response Count
Male	**82.1%**	248
Female	17.9%	54
answered question		**302**
skipped question		**1**

2. Your age

	Response Percent	Response Count
10-19	14.2%	43
20-24	13.9%	42
25-29	14.6%	44
30-34	10.3%	31
35-39	9.9%	30
40-49	**19.5%**	59
50-59	12.3%	37
60+	5.3%	16
answered question		**302**
skipped question		**1**

3. On average how many hours per day do you spend browsing the Web?
Please exclude email. 30min = 0.5 hours.

	Response Count
view	301
answered question	**301**
skipped question	**2**

4. On average how would you define the nature of your web browsing?
Choose a proportion between Fact Finding and Entertainment.

	Fact Finding									Entertainment	Rating Average	Response Count
	7.0% (21)	14.6% (44)	**20.2% (61)**	16.2% (49)	19.2% (58)	12.6% (38)	6.0% (18)	1.3% (4)	2.3% (7)	0.7% (2)	4.13	302
answered question												**302**
skipped question												**1**

5. Of your time spent browsing the Web, how much of that time is spent looking at familiar websites versus unfamiliar websites?
Choose a proportion between familiar and unfamiliar websites.

	Familiar Websites									Unfamiliar Websites	Rating Average	Response Count
	2.6% (8)	9.9% (30)	**24.2% (73)**	20.5% (62)	17.9% (54)	8.9% (27)	8.9% (27)	4.6% (14)	2.0% (6)	0.3% (1)	4.41	302
answered question												**302**
skipped question												**1**

6. On average how many hours per day would you spend using searching tools?
30min = 0.5 hours.

	Response Count
view	300
answered question	**300**
skipped question	**3**

7. Tick each of the search tools you currently use.

	Response Percent	Response Count
Google	**97.9%**	276
Yahoo! Search	27.0%	76
MSN Search	9.6%	27
AltaVista	9.6%	27
Ask	10.6%	30
Windows Live	9.6%	27
Open Directory	6.0%	17
AOL	1.4%	4
Searchbots	49.3%	139
Stumble Upon	16.3%	46
view Other (please specify)	24.8%	70
answered question		**282**
skipped question		**21**

8. Select the one search tool you currently use the most.

	Response Percent	Response Count
Google	**89.4%**	252
Yahoo! Search	2.8%	8
MSN Search	0.0%	0
AltaVista	0.0%	0
Ask	0.0%	0
Windows Live	0.4%	1
Open Directory	0.0%	0
AOL	0.0%	0
Searchbots	1.1%	3
Stumble Upon	0.7%	2
view Other (please specify)	5.7%	16
answered question		**282**
skipped question		**21**

9. For the search tool that you use the most, what feature do you like the most?

	Response Count
view	257
answered question	**257**
skipped question	**46**

10. For the search tool that you use the most, what feature do you dislike the most?

	Response Count
view	236
answered question	**236**
skipped question	**67**

11. If there was one feature you'd like to see added to your most used search tool, what would that be?

	Response Count
view	230
answered question	**230**
skipped question	**73**

12. Where did you hear about Searchbots?

	Response Percent	Response Count
Digg.com	12.1%	33
Del.icio.us	5.9%	16
DrWeb.de	2.9%	8
StumbleUpon	11.8%	32
Word of Mouth	11.4%	31
view **Other (please specify)**	**55.9%**	152
answered question		**272**
skipped question		**31**

13. Thinking back, what specifically made you decide to visit Searchbots?

	Response Count
view	251
answered question	**251**
skipped question	**52**

14. When you first saw Searchbots, what was your main motivation to proceed with building a Searchbot?

	Response Count
view	253
answered question	**253**
skipped question	**50**

15. Before using your Searchbot, what was the main thing you thought it might be able to do that other search tools don't?

	Response Count
view	240
answered question	**240**
skipped question	**63**

16. Did you take the Site Tour before building your Searchbot?

	Response Percent	Response Count
No	35.1%	92
Yes	**40.5%**	106
I don't remember	24.4%	64
answered question		**262**
skipped question		**41**

17. If you've taken the Site Tour how helpful did you find it?

	Not Helpful								Very Helpful	Rating Average	Response Count
	3.3% (5)	5.3% (8)	4.6% (7)	6.0% (9)	**19.9% (30)**	10.6% (16)	13.2% (20)	18.5% (28)	7.9% (12)	10.6% (16)	6.33	151
answered question												**151**
skipped question												**152**

18. What purpose did you believe the artificial intelligence served?

	Response Count
view	237
answered question	**237**
skipped question	**66**

19. How did adding artificial intelligence make you feel about your Searchbot?

	Response Count
	223
answered question	223
skipped question	80

20. How enjoyable was the experience of building your Searchbot?

	Low Enjoyment								High Enjoyment	Rating Average	Response Count
	1.9% (5)	4.2% (11)	6.9% (18)	9.5% (25)	13.0% (34)	11.5% (30)	16.8% (44)	**18.7% (49)**	8.8% (23)	6.37	262
answered question											262
skipped question											41

21. You assembled, coloured, named and added a personality to your Searchbot. Over time, describe how positively or negatively you reacted to these qualities in your Searchbot.

	Negative Reaction								Positive Reaction	Rating Average	Response Count
	1.9% (5)	4.2% (11)	6.9% (18)	5.3% (14)	**27.1% (71)**	11.1% (29)	11.5% (30)	19.1% (50)	6.9% (18)	6.1% (16)	6.10	262
answered question												262
skipped question												41

22. Any comments on the qualities of your Searchbot?

	Response Count
view	167
answered question	167
skipped question	136

23. How useful to you are the website thumbnail previews displayed as part of the search results?

	Not Useful									Very Useful	Rating Average	Response Count
	5.1% (13)	2.8% (7)	3.1% (8)	4.3% (11)	8.3% (21)	8.3% (21)	14.6% (37)	19.3% (49)	11.4% (29)	**22.8% (58)**	7.16	254
answered question												254
skipped question												49

24. Any comments on the website thumbnail previews?

	Response Count
view	135
answered question	135
skipped question	168

25. When your Searchbot asked you to rate the quality of a website, how motivated did you feel to feed your Searchbot information?

	Not motivated									Very motivated	Rating Average	Response Count
	7.1% (18)	2.0% (5)	3.5% (9)	5.5% (14)	13.0% (33)	**16.5% (42)**	13.4% (34)	15.0% (38)	11.4% (29)	12.6% (32)	6.50	254
answered question												254
skipped question												49

26. Any comments on rating the quality of websites?

	Response Count
view	113
answered question	113
skipped question	190

27. Your Searchbot's power level declined when it gave you results and increased when you feed it information.

How motivated were you to sustain your Searchbot's power level?

	Not motivated									Very motivated	Rating Average	Response Count
	7.1% (18)	5.1% (13)	4.7% (12)	11.0% (28)	**15.0% (38)**	14.6% (37)	14.6% (37)	10.6% (27)	7.9% (20)	9.4% (24)	5.90	254
											answered question	**254**
											skipped question	**49**

28. Any comments on having to feed your Searchbot to keep its power level healthy?

	Response Count
view	121
answered question	**121**
skipped question	**182**

29. If your Searchbot sent you an email asking you to answer a question and improve its artificial intelligence how motivated did you feel to feed your Searchbot information?

	Not motivated									Very motivated	Rating Average	Response Count
	5.6% (12)	2.8% (6)	6.1% (13)	5.1% (11)	10.3% (22)	10.3% (22)	**19.6% (42)**	13.1% (28)	13.1% (28)	14.0% (30)	6.63	214
											answered question	**214**
											skipped question	**89**

30. Any comments on the questions your Searchbot asked you?

	Response Count
view	104
answered question	**104**
skipped question	**199**

31. Do you believe that the quality of the search results improved, the more you fed your Searchbot?

	Response Percent	Response Count
No	8.7%	22
Yes	25.2%	64
I don't know	**66.1%**	168
answered question		**254**
skipped question		**49**

32. Any comments on feeding your Searchbot and the quality of the results?

	Response Count
view	81
answered question	**81**
skipped question	**222**

33. Did you ask your Searchbot to send you reports via email?

	Response Percent	Response Count
No	19.9%	50
Yes	**49.0%**	123
I don't remember	31.1%	78
answered question		**251**
skipped question		**52**

34. If you did receive a report how much did it contribute to the overall quality of your results?

	Low Contribution								High Contribution	Rating Average	Response Count
	9.8% (14)	4.2% (6)	6.3% (9)	8.4% (12)	**32.2% (46)**	12.6% (18)	10.5% (15)	9.8% (14)	2.1% (3)	4.2% (6)	5.20	143
										answered question		**143**
										skipped question		**160**

35. Your Searchbot can search in different modes using options like tags, location, color and mood. Please comment on your experience using any of these search chips.

	Response Count
view	137
answered question	**137**
skipped question	**166**

36. When feeding your Searchbot were you ever concerned about your privacy?

	Response Percent	Response Count
No	**75.7%**	190
Yes	24.3%	61
answered question		**251**
skipped question		**52**

37. Any comments on privacy issues and personalized search?

	Response Count
view	85
answered question	**85**
skipped question	**218**

38. In the process of using your Searchbot you personalized and interacted with a search tool (your Searchbot). Can you describe your interaction with your Searchbot by comparing it to another type of interaction, e.g. with an object or person?

	Response Count
view	113
answered question	**113**
skipped question	**190**

39. Overall, how do you rate the quality of the results you received from your Searchbot?

	Low quality								High Quality	Rating Average	Response Count
	8.4% (21)	5.2% (13)	6.0% (15)	9.6% (24)	**19.1% (48)**	15.1% (38)	15.5% (39)	12.0% (30)	6.4% (16)	2.8% (7)	5.51	251
										answered question		**251**
										skipped question		**52**

40. Overall, how do you rate the enjoyability of using your Searchbot?

	Low Enjoyment								High Enjoyment	Rating Average	Response Count
	6.0% (15)	4.0% (10)	5.6% (14)	4.4% (11)	12.7% (32)	13.9% (35)	**21.5% (54)**	13.5% (34)	10.0% (25)	8.4% (21)	6.28	251
										answered question		**251**
										skipped question		**52**

41. This research project examines how interface design effects the motivation of users to contribute information. Do you have any comments on how it feels to own a Searchbot and how motivated you are to feed it information?	
	Response Count
view	118
answered question	**118**
skipped question	**185**

42. Any other comments or suggestions you may have on using your Searchbot?	
	Response Count
view	88
answered question	**88**
skipped question	**215**

Appendix III: Google Analytics for Searchbots

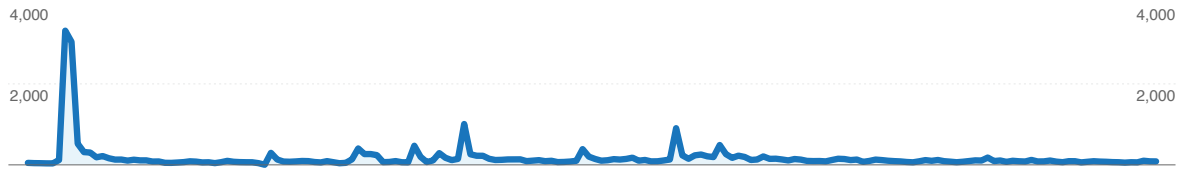
A summary of the Google Analytics for Searchbots follows. The full interactive reports for Searchbots can be viewed online using the following login details:

http://www.google.com/analytics/
Email: bot@searchbots.net
Password: viewstats

www.searchbots.net

Dashboard

Dec 1, 2006 - May 31, 2007



Site Usage

30,478 Visits

188,719 Pageviews

6.19 Pages/Visit

10.05% Bounce Rate

00:04:00 Avg. Time on Site

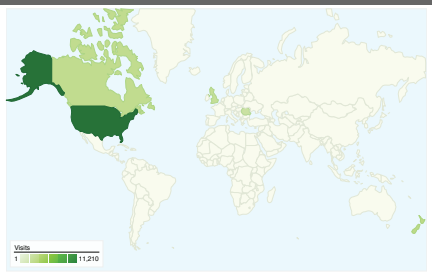
78.11% % New Visits

Visitors Overview

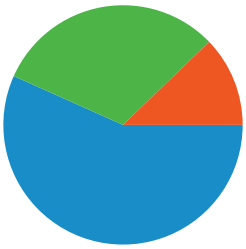
Visitors

Visitors

Map Overlay world



Traffic Sources Overview



- **Referring Sites** 17,279 (56.69%)
- **Direct Traffic** 9,481 (31.11%)
- **Search Engines** 3,717 (12.20%)
- **Other** 1 (> 0.00%)

Content Overview

Pages	Pageviews	% Pageviews
/index.php	38,839	20.58%
/welcome.htm	26,585	14.09%
/mybot.htm	15,745	8.34%
/site.htm	9,990	5.29%
/build_bot.htm	9,507	5.04%

Goals Overview

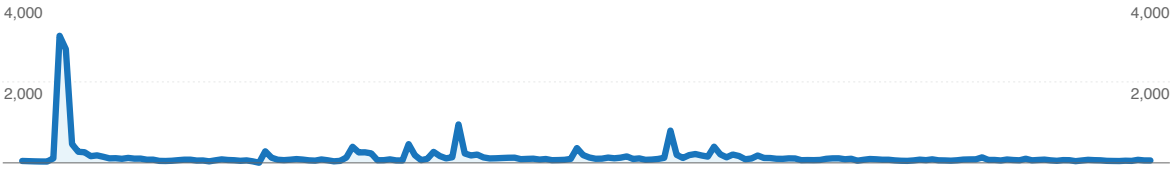
Goal Conversions

Goal Conversions

www.searchbots.net

Visitors Overview

Dec 1, 2006 - May 31, 2007



23,907 people visited this site

30,478 Visits

23,907 Absolute Unique Visitors

188,719 Pageviews

6.19 Average Pageviews

00:04:00 Time on Site

10.05% Bounce Rate

78.15% New Visits

Technical Profile

Browser	Visits	% visits
Firefox	15,835	51.96%
Internet Explorer	11,803	38.73%
Safari	1,256	4.12%
Opera	1,086	3.56%
Mozilla	255	0.84%

Connection Speed	Visits	% visits
Unknown	10,054	32.99%
DSL	8,296	27.22%
Cable	7,507	24.63%
T1	2,699	8.86%
Dialup	1,788	5.87%

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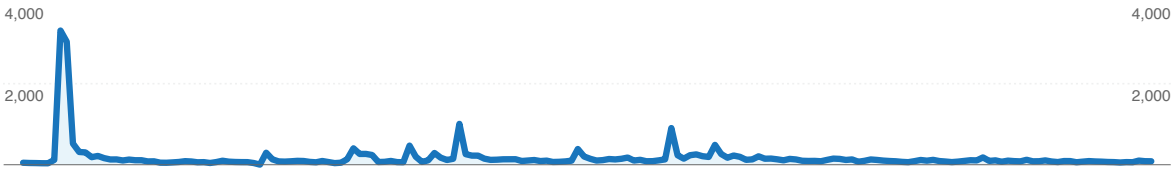
Traffic Sources Overview

Dec 1, 2006 - May 31, 2007

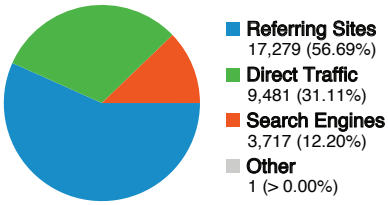


All traffic sources sent a total of 30,478 visits

31.11% Direct Traffic

56.69% Referring Sites

12.20% Search Engines



Top Traffic Sources

Sources	Visits	% visits
(direct) ((none))	9,481	31.11%
digg.com (referral)	4,637	15.21%
google (organic)	3,454	11.33%
stumbleupon.com (referral)	2,240	7.35%
readwriteweb.com (referral)	1,445	4.74%

Keywords	Visits	% visits
searchbot	698	18.78%
search bots	544	14.64%
search bot	427	11.49%
searchbots	351	9.44%
create your own robot	145	3.90%

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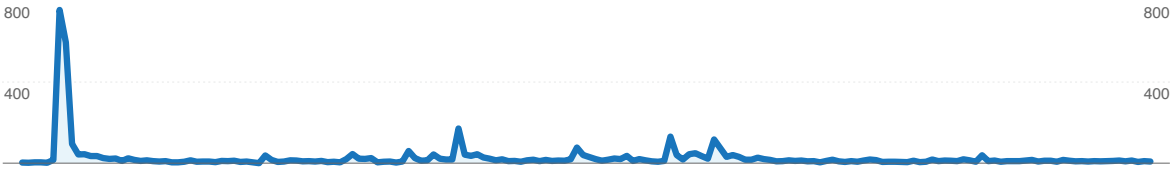
Goals Overview

Dec 1, 2006 - May 31, 2007



Visitors completed 4,697 goal conversions

4,697 conversions, Goal 1: New Searchbot

Goal Performance

Goal Conversion Rate

Goal Conversion Rate
15.41%

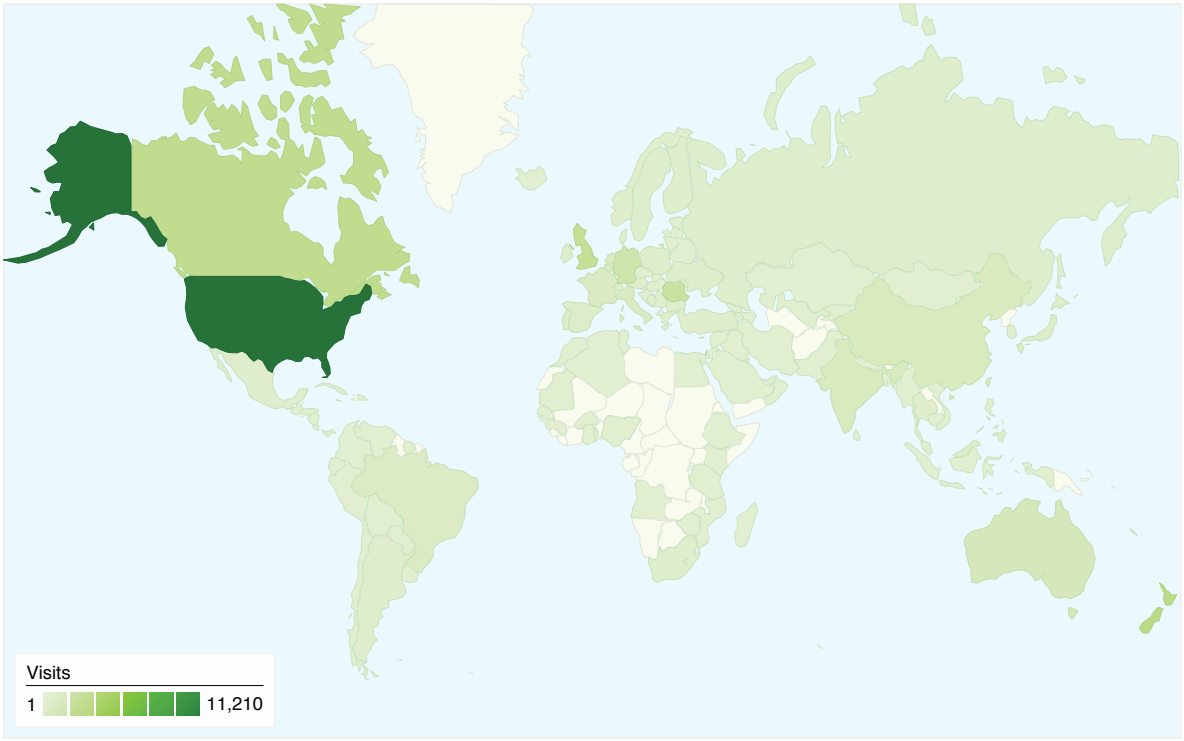
Total Goal Value

Total Goal Value
$0.00

www.searchbots.net

Map Overlay

Dec 1, 2006 - May 31, 2007



30,478 visits came from 144 countries/territories

Site Usage

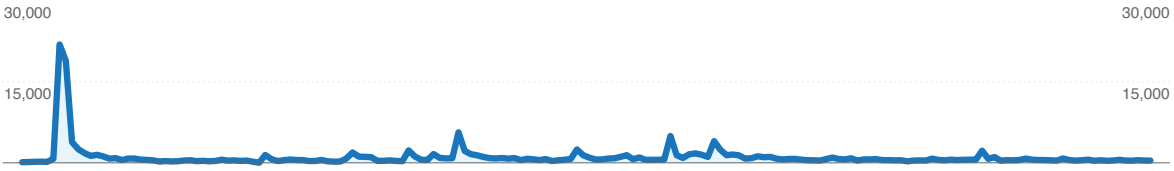
Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
30,478	6.19	00:04:00	78.15%	10.05%
% of Site Total: 100.00%	Site Avg: 6.19 (0.00%)	Site Avg: 00:04:00 (0.00%)	Site Avg: 78.11% (0.05%)	Site Avg: 10.05% (0.00%)

Country/Territory	Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
United States	11,210	6.22	00:03:41	84.83%	8.66%
New Zealand	2,409	8.61	00:08:14	48.98%	8.63%
Canada	2,182	7.23	00:03:50	78.78%	7.42%
United Kingdom	1,903	6.39	00:03:41	86.18%	11.30%
Romania	1,553	4.18	00:01:51	88.99%	14.81%
Israel	1,382	2.69	00:01:10	15.77%	11.14%
Germany	1,213	6.81	00:04:24	82.28%	10.47%
Australia	732	6.91	00:04:54	81.42%	9.56%
China	594	5.54	00:04:54	80.13%	12.96%
India	576	5.53	00:04:45	85.76%	17.01%

www.searchbots.net

Content Overview

Dec 1, 2006 - May 31, 2007



Pages on this site were viewed a total of 188,719 times

188,719 Pageviews

141,356 Unique Views

10.05% Bounce Rate

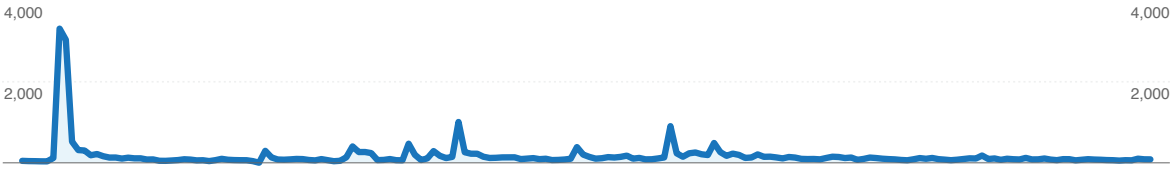
Top Content

Pages	Pageviews	% Pageviews
/index.php	38,839	20.58%
/welcome.htm	26,585	14.09%
/mybot.htm	15,745	8.34%
/site.htm	9,990	5.29%
/build_bot.htm	9,507	5.04%

www.searchbots.net

New vs. Returning

Dec 1, 2006 - May 31, 2007

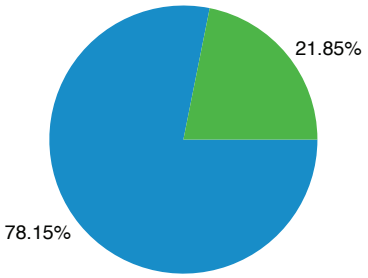


30,478 visits from 2 visitor types

Site Usage

Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
30,478	6.19	00:04:00	78.15%	10.05%
% of Site Total: 100.00%	Site Avg: 6.19 (0.00%)	Site Avg: 00:04:00 (0.00%)	Site Avg: 78.11% (0.05%)	Site Avg: 10.05% (0.00%)

Visitor Type	Visits	Visits	Visits
New Visitor	23,818	78.15%	
Returning Visitor	6,660	21.85%	



1 - 2 of 2