

Frame Change and Phase Shift Detection Using Documents' Emotionality  
and Semantic Networks:  
A 25-Month Analysis of "Second Life" News Documents

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## Abstract

### Frame Change and Phase Shift Detection Using Documents' Emotionality and Semantic Networks:

#### A 25-Month Analysis of "Second Life" News Documents

Analysis of 8,365 news documents in a monthly time-series of initial coverage about "Second Life," found, using software tools, that the ratio of positive to negative emotion revealed three phase shifts and three frame changes about "Second Life:" 1) virtual economic markets, 2) increased corporate activity, and 3) avatar sex.

## Introduction

The link between the research on agenda-setting (McCombs & Shaw, 1972; Dearing, & Rogers, 1996) in which the amount of news coverage that stories receive is found to influence how important the audience perceives the topics has been fruitfully connected with framing theory (Entman, 1993; Scheufele, 1999; 2000; Reese, Gandy, & Grant. 2001) as a means of explaining why these agenda-setting processes occur. It is not merely the prominence of the story in the media but how the content is framed that adds explanatory power to the link between coverage and audience perceptions.

As a means of developing detailed evidence, media framing studies often investigate a single important issue or event. Even when multiple story streams are analyzed human coding limitations may narrow the range of story types analyzed. In addition, media venues chosen may be limited to those that are most popular or elite (Reese, Gandy, & Grant. 2001). Conceptually, such a focus makes sense to the extent that there is a framing sort of agenda-setting among media and often from government sources to media such that once elite sources frame a story, other media outlets follow suit. This can justify studying those media that are most influential in initial framing of stories.

Nevertheless, this assumption, while persuasive and supported by empirical evidence, places an *a priori* limit on detection of variation in framing, particularly across diverse types of media whose expansion has increased with the proliferation of multiple forms of online venues. Absent such constraints, a variety of media: newspapers, wire services, trade press, blogs, television transcripts, magazines, web publications, etc. may increase generalizability, or more variation in framing than is currently assumed, or

reveal frame-by-medium type interactions.. Theoretical insights may be further enhanced by studying framing changes over time. While the study of change over time is fundamental to the agenda-setting and framing literatures given the generative theoretical constructs and principles, the length of time series tends to be set according to the typical story life-cycle and therefore relatively short in duration, on the order of weeks, not years. Extension of time-series along with elaboration of news venues may provide added benefit to inductive detection of new theoretical issues in these lines of research as has been shown by such work, among other examples, as that of Entman and Rojecki's (1993 ) study of framing of the nuclear freeze movement over a three-year period, Hibbs, (1993) study of framing in 10 years of U.S. trade policy coverage, or Ashley and Olson (1998) study of framing of the women's movement over a twenty-year period.

Longer-term time-series framing studies become more cost-effective with the aid of software that performs some automatic analysis of stories. Large story corpora can be automatically indexed for categorical features such as changes in emotionality of coverage. These may mark phase shifts in both news framing and amount of coverage. In addition, automatic semantic network analysis for word-pair changes reveal shifts in detailed framing content. Furthermore, node-centric semantic networks tied to a key story word, such as an actor name or issue label, can describe frames in fine-grained detail.

Accordingly, the main goal of this study is to explore an approach to framing that analyzes many more stories, here analyzing 8,365, and over longer periods of time than normal, using a 25 month time-series of the first two years of coverage about "Second Life," an online 3D avatar-based virtual reality social environment. The ratio of positive to negative emotion in content, when overlaid on the amount of coverage series, revealed

three phase shifts and a sequence of three frame changes about “Second Life,” summarized briefly as: 1) virtual economic markets, 2) increased corporate activity, and 3) avatar sex. The use of semantic network analysis tools (Author, ; ; ; ) in addition to dictionary-based automatic categorization of content features in the tradition of the General Inquirer (Stone, 1966) as represented by the PC program Linguistic Inquiry and Word Count (LIWC) (Pennebaker, Booth, & Francis, 2007), provides a means for elaborating the content details of these three frame markers.

### **Choice of Content Focus**

News about new communication technologies occupies an increasing portion of the news space as information and communication technology innovations and applications grow. Certain topics such as “Web 2.0” and “social networking” receive large volumes of coverage in non-scientific contemporary media outlets, yet the nature of this coverage is relatively unstudied few some notable exceptions (Jenkins, 2006).. There is more attention to research on how particular applications are used, by whom, and for what purposes and with what effects than on more macro-level considerations on how these technologies are framed in the media and what changes in framing may be associated with changes in the amount of coverage and its emotional tone. The premise of this paper is that tying together research on media coverage of Information and Communication Technologies (ICTs) with mass Communication theory and research and can result in productive synergies.

While there are many assertions by media observers on the relationships between the negatively of news coverage and its frequency, there is little empirical evidence,

particularly examining changes in media coverage over time. At the same time, framing detection can be improved through interpretation of automatic content analysis using dictionary-based and semantic network analysis techniques.

### *Framing*

One of the approaches to news content analysis that continues to gain favor among researchers is the area of “framing,” that is how stories are placed by media outlets into a linguistic context, a lead narrative about the nature of the actors and issues. Framing is most often conceptualized as a subset of agenda-setting research (Scheufele, 1999, 2000; Ashley & Olson, 1998). The main idea is that the media agenda frames the audience’s interpretation of news content. Nevertheless, principles of framing can explain the relationship between news sources and journalists with the former framing news coverage of the latter (Shoemaker & Reeves, 1996; Miller, Andsager & Riechert, 1998). Framing effects on the media can be stimulated by public relations activities. To the extent the resulting news stories are contextualized including the reasoning, metaphors, or image characterization of actors or issues in the original public relations message, the greater the framing effect on the media. In contrast to priming, which does not result in news coverage that is directly related to the campaign content, but which produces news stories that are related to the primer by diverse semantic associations, framing produces a commonality of semantic associations between the public relations message and the media message. The strongest form of framing effect is when the commonality occurs across multiple media outlets

How communication technology stories are framed provides a window into how the larger society at the macro level is conceptualizing these new media, and in turn, how audiences may adopt these frames, which structure their perceptions of the media and may have effects on the market for the technologies, purchase, adoption, and diffusion patterns, and how the media become assimilated into a usage space by social actors at various levels, from societal, through organizational, and smaller units of analysis down to the individual or intra-individual levels..

A goal of this research is to explore how a set of methods for representing change over time in news stories about communication technology, in this case about the 3D virtual reality technology “Second Life,” by adding analysis from content analysis of the news using analysis of its emotional content and of its semantic networks to observe whether changes in technology media coverage can be informed by these hybrid qualitative/quantitative methods.

#### *Measurement Issues*

Traditional studies of communication campaign effects typically measure the dependent variable using some form of attitude response scales measured in an ordinal fashion, such as with Likert-type agree-disagree scales. Evaluation studies done for industry purposes often count only the number of stories and their column inches. Studies of a more academic bent typically measure media content by rank ordering story topics and associating these ranks with audience perceptions of issue importance, using either ranks or Likert-type scales.

Both academic and practical research concerned with media content may benefit from more refined measures. For example, among the most fine-grained of measures are

from studies of the linguistic structure and semantic content of news (Van-Dijk, 1983; Duszak, 1993). Although these studies move in a good direction in their micro-analysis of content, further improvements can be made through automating portions of the measurement process. One way to do this is to perform statistical content analysis of word cooccurrences using network analysis methods (Author, ; ; , ; Coauthor & Author, ; ; Coauthor & Author, ; ; Author & Co-Author, , Diesner & Carley, 2004). This is useful because it analyzes the full text of documents without selective human coding.

In metaphoric terms, consider that the global semantic domain is like a balloon. Its surface structure, when examined closely, is a network of semantic associations. As a part of the surface is pinched and pulled out --as a result of a communication message effect -- other regions of the balloon surfaces stretch. This stretching breaks some of the interlocking structures, resulting in a more radial and extensive network structure emanating from the pulled surface area. In network analysis terms a more pronounced center/periphery structure is created, at the expense of a more interlocking structure. Structural holes (Burt, 1992) are formed that can be bridged by diverse nodes.

#### *Semantic Network Evidence for Framing*

Research by Hibbs (1993) using Author's ( ) word-network analysis software and methods showed evidence of a semantic framing effect over 10 years of news coverage in national newspapers about U.S. trade policy. Framing was evidence by reduction in variety of the language associated with trade policy in news stories and more explicit linkages to the manifest sources of the content.



Framing reduces the variety of uses of the associated words and increases their link strength to a more narrow set of words. The meaning of the concepts reflected in news stories becomes more coherent and simple as time passes. There is less equivocality and polysemy in meaning as the range of associations of the key words to others declines. At the same time, the frequency of usage of the key words increases as they decrease in variety of linkage. Such was the effect observed in Hibbs' study of the ten-year period of nationwide newspaper media coverage about U.S. trade policy. This is a broad category of content and it was studied using macro-level network analysis methods that mapped the global domain of content over a yearly time series. In contrast, the present study investigates content at the micro-level of phrases, in particular a two-word phrase. It is possible that semantic framing effects may occur at both macro and micro levels, but there is no additional research to suggest whether this is likely or not.

## Methods







### *Population of News Content*

News coverage of the 3D virtual reality, avatar-based environment of Second Life (secondlife.com) was selected for this initial investigation. Reasons for this choice are that we are able to observe coverage from the beginning of coverage through the take-off portion of the diffusion curve. As well, because the content involves communication technology, this contemporary nature allows for observing news coverage in a variety of traditional and online media. Moreover, attention to Second Life among observers of

trends in communication technology has increased with the number of users numbering over 6.5 million and continuing to expand. Individuals as well as corporations are using Second Life for a variety of 3D virtual reality applications. These factors make it an interesting case to examine in this study of the full-text of news documents over time and statistical content analysis to analyze changes in story emotional content, story framing, and amount of coverage over a two year monthly time-series.

The first step in such research is to obtain the corpus of documents and perform the preliminary analysis. Such an initial analysis is exploratory and seeks to be descriptive and use visualization to help in interpretation of data description. LexisNexis Academic was used as the search tool. The search term was: caps(Second Life). This capture articles that had the term as a two-word phrase and which had some of the characters capitalized. A monthly interval was selected beginning with the date of document collection, October 12, 2007 and moving back 30 days for each monthly time segment to September 13, 2005. This results in 25 observations points. A monthly interval was chosen because at larger intervals the number of hits can exceed display limits, above 998 hits. LexisNexis allows download of up to 500 hits per file. The corpus downloaded was comprised of the full text of 8,365 documents across a range of source types. The total file size was 40.5 megabytes. Figure 1 shows the breakdown of sources and hits over time.

Sources selected were:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/>  Major U.S. and World Publications | <input checked="" type="checkbox"/>  Web Publications |
| <input type="checkbox"/>  Major World Publications (non-English)       | <input type="checkbox"/>  Company                     |
| <input checked="" type="checkbox"/>  News Wire Services                | <input type="checkbox"/>  SEC Filings                 |

-  TV and Radio Broadcast Transcripts
-  Legal
-  Blogs

Figure 1 about here

Methods that are useful in such research include automated semantic network analysis using the semantic network analysis software (Authori, ; ; ) for representing the semantic networks occurring across large bodies of documents. The program tabulates the cooccurrences of words appearing within a specified distance from one another in the documents. The optimal word window size has been found to be three words before and after each word in the text for a functional word window size of 7 words. Once the program produces counts of word pairs these data can be compared by performing tests for statistically significant differences in word-pair frequencies and individual word frequencies between different bodies of documents. Both what is different and what is similar can be of interest. For such comparisons, documents can be segmented by source or type or by time intervals and differences identified in relative frequencies of words and word pairs. Overall word networks can also be quantified and compared. This is accomplished by input of the word-pair data to various social network analysis software such as NEGOPY (Richards, 1985), MultiNet (Richard & Seary, 2007), UCINET (Borgatti, Everett, & Freeman, 2002), and Pajek (Batagelj & Mrvar, 2003). Such network analysis programs are useful in mapping the structure of the word

networks, treating words as nodes and their cooccurrences as links, with frequencies of cooccurrences as link strengths. In this study, because the central concept of the news coverage was itself a two-word phrase, “Second Life,” to increase the coherence of the word-network analysis we used a pre-processing step of changing this bi-gram to a unigram by a simple search and replace with a text-editor so that Second Life was changed to “Secondlife.”

#### *Positive/Negative Emotion and Amount of Coverage*

Observers and critiques of news coverage make the simple assertion that negative news is what is attractive to media gatekeepers. Nevertheless, it is interesting to explore the change in news coverage of a long period of time from the beginning. To do so, we used the automatic content analysis program LIWC 2007 (Pennebrook, Booth & Francis, 2007) to compute the relative frequency of positive and of negative words month by month in the documents. We then computed the ratio of positive to negative words. The absolute values for the positive/negative ratio and the total number of stories were converted to z-scores and plotted in Figure 2.

Figure 2 about here

We observe that while amount of coverage follows a relatively smooth curve from the beginning of the series in September 13, 2006 through October 12, 2007. While total stories show a gradual increase, the positivity ratio oscillates considerably during this period. Then, the two series begin to move in opposition between time period 17 and 18,

from January 13 to March 12, 2007. After this point the coverage, beginning with time point 19 the two series align such that as positivity increases or decreases news coverage increases decreases. It is as if it took nearly a year of large oscillations in positivity for drive the graduate building of coverage. Once that coverage reached the take-off period of a rapid increase in slope, the two series were in opposition for two months, after which time they synchronized for the remaining six months.

In the analysis to follow we will use word-network data in association with jumps in the amount of coverage to seek insights into their relationship. It is noteworthy that content accounts for the period during which the curves become synchronized. There is a new framing of media coverage at that time, after which changes in the two series seem to reflect a relatively orderly positive relationship. The possible reason for this will be explored.

#### *Using Word-Network Framing Analysis to Predict Change in Coverage*

When describing time-series data it is useful to identify where major jumps occur in number of hits and seek to explain these. There were three such periods: September 13 - October 12, 2006 to October 13-November 12, 2006 (207% increase), January 13-February 12 to February 13-March 12, 2007 (170% increase), and April 13-May 12 to May 13-June 12, 2007 (144% increase). For each of these contiguous periods the word pairs were analyzed to see which were significantly increased in relative frequency using a z-test for proportions. These pairs were produced by a word-network analysis for each time period using the semantic network analysis program. Documents for each month were aggregated by source and analyzed with word-network analysis software. Default

values were used dropping links and pairs that occurred less than three times, preserving word pair order, dropping numbers, analyzing pairs within sentences, using a word window size of 3 words on either side of each word, with no stemming, and a drop list of 581 function words.

*September 13 - October 12, 2006 to October 13-November 12, 2006*

The word pairs that had the most significant increases in relative frequencies from the month beginning September 13, 2006 to the one beginning October 13, 2006 were the following:

virtual economies  
Reuters news  
adam pasick  
secondlife reuters  
adam reuters  
Reuters secondlife  
abstract television  
Medium television

Articles stressed that virtual economies were operating on Second Life and that Reuters had begun a special news service about Second Life. The word network chart of the most frequent words linked around Second Life was rendered by Netdraw (Borgatti, 2005) using word pairs that with frequencies greater than 25 occurrences. Nodes colored green comprised substantive word pairs with most significant increases from the previous time period.

Figure 3 about here

One may want to consider the news stories that accounted most for the changes.  
Here is the most representative example:

October 17, 2006 Tuesday

All but Toronto Edition

Reporting from the virtual world: New sector born

SECTION: FINANCIAL POST; Pg. FP1

Reuters Inc. is opening a cyber-newsroom in the online simulation game SecondLife, a move analysts say finally heralds the long-awaited arrival of an entirely new business sector: virtual reality.

"If it's not now, it soon will be" a new industry, said Rob Enderle, principal analyst with the Enderle Group in California. "For all intents and purposes, [SecondLife] is like its own small country."

The London-based news agency said as of tomorrow it would begin covering

financial news that transpires within the online virtual world. Adam Pasick, a reporter based in London, will serve as bureau chief under the online name "Adam Reuters." He will also report on real-world events that affect the three-dimensional online universe.

SecondLife is operated by San Francisco-based Linden Lab and has nearly 1 million members who create characters, live out alternative lives, and buy and sell virtual goods and services within the universe with real-world money. They have created a "virtual economy" that is generating about US\$350,000 in transactions a day or about US\$130-million a year.

That figure is growing at a rate of 10% to 15% a month, according to Reuters.

Mr. Pasick said the move was part of Reuters' strategy to reach new audiences with the latest technologies, and that the company wasn't entirely sure how it would turn out.

"It's a bit of an experiment for us. It's as much for us to find out about SecondLife than to report on it," he said.

SecondLife is but one of a number of virtual worlds making real-currency transactions, with others including World of Warcraft, Eve Online and Montreal-based Weblo.com. The overall number of users -- World of Warcraft, an online role-playing game, has more than seven million members itself -- and amount of financial transactions has drawn the attention of authorities. The U.S. Congress has taken note of the virtual economies and has launched an



investigation as to how their transactions should be taxed.

Reuters is likely to expand its coverage to other worlds in the future, Mr. Pasick said. The news agency chose SecondLife because it is less of a game than its counterparts and more of a free-market economy.

"I think it will be interesting to do comparative economics, to compare the economy in World of Warcraft to the economy in SecondLife. But that's down the line and SecondLife is enough for us now," he said.

A number of corporations, including Toyota Motor Corp., Sony BMG Music Entertainment and Sun Microsystems Inc., are already involved in SecondLife, using the universe for training or market research.

Analysts are saying corporate interest in such online universes, as well as other Web properties such as YouTube and MySpace.com, is definitive proof of a second Internet boom. The difference this time is that the boom will be sustainable, Mr. Enderle said.

"It looks like we've figured out a lot of the things that weren't working during the first boom and now the market is moving toward taking advantage of the technologies we hoped to take advantage of half a decade ago, but things just weren't ready," he said.

Solutions Research Group analyst Kaan Yigit said the virtual environments are not a fad but part of a deeper trend. The worlds are near a tipping point in

terms of consumer and advertiser interest, so there will likely be many more announcements similar to Reuters'.

"No one quite knows how these environments will evolve from a business standpoint," he said. "We find that all age groups show a greater 'need for escape' in a culture that's spinning faster, and online gaming and virtual environments represent a perfect escape."

*January 13-February 12 to February 13-March 12, 2007*

For the second period of large increases in hits, the first period in which the positive/negative content ratio became negatively correlated with amount of stories, from the month beginning January 13 to the one beginning February 13, 2007 the most significant word pairs of note were:

alexis christoforous

electric sheet

cbs says

film promo

These pairs were connected with a CBS announcement forming Electric Sheet as a company to produce media advertising and promotion materials for corporate sponsors in Second Life. Figure 4 shows the word network surrounding Second Life for frequencies of pairs greater than 50. The lower frequencies are dropped until the number of nodes and links reduces to a level that is visually interpretable. So, in periods in which

the total amount of coverage is greater, it is necessary to drop more lower frequency word pairs.

Figure 4 about here

The most exemplary documents were from CBS television news, NBC television news, and the Associated Press. All three stories were framed in terms of corporate entry into Second Life.:

CBS News Transcripts

February 27, 2007 Tuesday

SHOW: CBS Morning News 6:30 AM EST CBS

CBS MoneyWatch

ANCHORS: SUSAN McGINNIS

REPORTERS: ALEXIS CHRISTOFOROUS

SUSAN McGINNIS, anchor:

On the CBS MONEYWATCH, investors will try to turn the market around today after the Dow sank for the fourth day in a row. Alexis Christoforous has the numbers; plus, new signs the hype over hybrids may be running on fumes.

ALEXIS CHRISTOFOROUS reporting:

America's fascination with hybrid vehicles may be waning. Registrations of new hybrid cars increased 28 percent last year. That represents just 1 1/2 percent of all new vehicle registrations, and the rate of growth is slowing. Toyota's Prius remains the most popular, accounting for accounting for nearly

half of all hybrid registrations.

Krispy Kreme is getting health conscious, unveiling a whole wheat glazed doughnut. Made with 100 percent whole wheat, it contains 180 calories. Krispy Kreme hopes the new offering can boost its bottom line and its stock price, which has gone from \$50 a few years ago to about \$4 a share.

On Wall Street, stocks kicked off the new trading week on a down note. The Dow off 15 points; the Nasdaq gave back 10 1/2.

CBS is going virtual. In the hopes of expanding its reach beyond the living room, the media giant and parent company of this station will invest \$7 million in Electric Sheet, a company that develops 3D properties in virtual worlds like SecondLife. CBS says those online worlds represent the next generation of communication platforms. CBS has already worked with Electric Sheet to film a TV promo inside "SecondLife" and to develop a "Star Trek"-themed area.

That's your MONEYWATCH. In New York, I'm Alexis Christoforous.

The Today Show on NBC also features a segment on Second Life.

March 2, 2007 Friday

SHOW: 8:40 am WDIV

>> Good morning. >> let's get right to it. With the help of your company  
We've created an avitar -- is that the correct term? >> that's correct. >> of me  
And an avitar of you. We're going to go out of the studio in our virtual life.  
>> we're at NBC headquarters. We've built a place that a lot of the audience is  
Already familiar with. >> normally if we were controlling our avatars in front  
Of us, but we have Jessie and Kerry controlling us. I'd like to go inside 30  
Rockefeller center. Can we do that? >> uh-huh. >> Sibley, come along with me.  
There you go. What can I do with this? Can I meet other people in here? >>  
Absolutely. You can meet people from around the world in here, from around the  
Real world. >> how hard was it to create the avitar of me? >> people can come in  
Here and create an avitar in a few minutes, but we wanted to make one look like  
You, so we took some photographs and it took us a day to put together this  
Avitar. >> can we make it so we're not alone? Can we bring some people in and  
Maybe interact with some of those people? Is that possible? They're working on  
It right now. What are the uses for this? What is this going to be down the  
Road? What are people going to do with it? >> in a lot of ways it's just like  
The web in 1993. A lot of the good ideas haven't been thought of yet. There are  
People learning, education going on, entertainment, people are meeting each  
Other, dating. It's limitless. >> how do you date in a secondlife? >> sure,  
Just like on the web, you can meet people, right, and then you go and find them

In real life, here you can actually do more because here we have a whole crowd of people who are here in one place. >> and so I could take my avitar using my Laptop and walk up to any of these people and actually start a conversation? >> That's exactly right. You get to know them, establish a relationship, hang out, Go to a virtual bar. >> what are the restrictions of technology like this? And Maybe the better way to phrase the question, Sibley, is what should the Restrictions be? >> well, that's an open question, as well. Right now, for Example, in the secondlife we're in, there's a separate team grid. So everyone That is 13 to 17 years old goes to a separate area that doesn't have results. That's one restriction. >> our camera person we were seeing a second ago, that's Basically the way we're viewing ourselves in our second lives? >> that's right. >> is that right? How much does it take in terms of technological know-how to Participate in something like this? >> not too much really. You download a piece Of software, you fire it up, and the reality is because it's 3-d, like the real World, people can quickly understand. It's not like you have to learn a whole Interface. >> and there are thousands of locations. If I wanted to roam, I Understand this particular location has about a 16-acre boundary, is that right? >> right, long island. >> but you could take me on vacation. There's a U.S.A. Jersey behind us. I'm not sure what sport he's playing, but he's a little bit of A weird avitar actually. >> you'll see that quite a bit. >> are there strange Ones? >> if you let people be creative, they'll come in here as anything. >> That's great. Sibley, thank you very much. This is the first time I've been in a Virtual reality setting. It's the first time I've had a secondlife. People Think I have to get a first life first. Thank you very much. We appreciate it. Up next, brand loyalty, why you keep going back to the same products and Companies over and over again. First this is "today" on NBC.

This story appeared in the Associated Press:

Associated Press Financial Wire

February 26, 2007 Monday 5:07 AM GMT

Virtual design wizards kept busy by companies eyeing 3-D online worlds such as  
'SecondLife'

SECTION: BUSINESS NEWS

DATELINE: LOS ANGELES

When Toyota Motor Corp. wanted to promote its new Scions to young buyers, it turned to one of the growing number of digital design companies doing business in the popular online universe "SecondLife."

The firm, Millions of Us, conjured up Scion City a futuristic urban island with a dealership that sells the cars and a racetrack where consumers' online personas can take them for virtual test drives.

"The goal is to build a community in 'SecondLife' that is really engaged and really excited and really involved," said Reuben Steiger, 35, chief executive of Sausalito-based Millions of Us.

Designing attractions to capture the attention of those online visitors is becoming big business as major corporations move to establish marketing footholds in 3-D virtual worlds such as "SecondLife," which was founded in 2003

by San Francisco-based Linden Lab.

While it feels like a video game, with cartoonish-looking graphics, computer users easily become immersed in the action via cyber stand-ins known as avatars. Through their animated alter-egos, users can travel the simulated expanse and chat, fly, dance or even simulate sex with others.

"Five years from now, it will be near-photo quality," Steiger said. "The experience of walking in will be like stepping into a movie."

"SecondLife" now boasts more than 3 million registered users worldwide, and Linden Lab estimates around 1.3 million users logged onto the realm in the past month.

Companies pitching everything from virtual T-shirts to entertainment have followed the crowd.

Since launching in July, Millions of Us has done projects for General Motors Corp., Sun Microsystems Inc., Warner Bros. Records, Microsoft Corp., 20th Century Fox, Intel Corp. and rapper Jay-Z, among others. Other major companies that have established a presence in "SecondLife" include IBM Corp., Dell Inc., CNet Networks Inc. and Adidas AG.

Computer users have been gathering in 3-D, virtual environments for years using games such as "World of Warcraft" and "Star Wars: Galaxies."



Companies behind those games employ their own cadre of programmers and designers to build the worlds from scratch. Users have limited leeway, if any, to modify their virtual behavior or create new objects.

"SecondLife," however, comes with a built-in interface to transform geometric shapes into just about anything, and users can take classes within the realm or use tutorials to beef up their object-building skills.

Those who take the time to learn a more advanced programming language can also write "scripts" that control the movement of avatars or how they interact with objects.

Users have created everything from flying birds to waves crashing ashore by their tropical resort. And they retain the intellectual property rights to whatever they create.

A surprising number of structures within "SecondLife" are richly elaborate, with design and function on par with content seen in professionally designed games. The best simulate real-world details, such as landscaping, different textures for brick or marble, and realistic lighting effects.

Many other structures, however, are rudimentary and unpolished. Often they are simple box-like shapes, with few or no objects inside. Some are missing walls or are just unfinished floating slabs.

That disparity in quality is reminiscent of the early days of the Web, when

just about anyone with a few HTML skills could make a personal Web site. Companies seeking more compelling presentations often turned to Web design firms.

The same dynamic has fueled demand for 3-D design houses. Dozens of willing developers around the world are listed on the "SecondLife" Web site alone.

"Most companies who are doing things in 'SecondLife' are reaching out to specialist designers to craft their experience," said Mark Kingdon, CEO of digital marketing agency Organic Inc. in San Francisco.

Creating a virtual destination packed with interactive content takes more than an expert in the digital stitching that keeps "SecondLife" together.

Artists, writers, marketing gurus and others are often needed to develop everything from the look and design of a project to event programming within the space that will keep people coming back.

Millions of Us has 13 full-time staffers and a stable of 60 contract artists and programmers it can hire as needed, said Steiger, a former Linden Lab executive. It took his company about 10 weeks to build Scion City.

Steiger said an initial build might cost a client between \$75,000 and \$100,000. Another \$50,000 might pay for six or so events at the site. Monthly support fees could add another \$10,000 a month to the cost, Steiger said.

The average cost of a project in "SecondLife" for a major company runs in the low six-figure range, Steiger and other developers said.

At this stage, that's still a relatively modest investment for major corporations, Kingdon said.

"A lot of these companies are treating it as marketing research and development," he said. "It's a small, growing audience now. It doesn't offer the reach of say, MySpace, by any stretch of the imagination."

Even so, visitors to the branded virtual playgrounds can potentially become far more engaged with a brand than by simply browsing a Web site with banner ads.

"A good campaign, you can expect a lot of people to pick up and use your virtual product for hours," said Sibley Verbeck, CEO of The Electric Sheep Co. Inc.

Earlier this month, AOL launched an interactive "SecondLife" mall dubbed AOL Pointe, where visitors can buy clothes for their avatars, rip it up in a skate park and gather in an amphitheater to watch videos, among other activities.

Like many other companies, AOL sees the site as the next step for the Web, an Internet in 3-D.

"There's a possibility that this could bring a whole new aspect to computing

and to community," said Adrienne Meisels, AOL's vice president of new business. "It's a learning platform for us."

Washington, D.C.-based Electric Sheep built AOL's site in "SecondLife" and has designed other projects for Major League Baseball, Yahoo Inc., Nissan and Sony BMG Music Entertainment.

The firm, which takes its name from the Philip K. Dick novel that inspired the 1982 film "Blade Runner," has also worked on projects in other virtual worlds separate from "SecondLife."

In one example, last year, the firm built content for MTV's Virtual Laguna Beach, the online 3-D hub for fans of the show "Laguna Beach."

Verbeck, 31, declined to discuss company revenue. But he said it launched about two years ago with only a handful of employees and now has 50 people on staff.

"There's an incredible amount of demand," Verbeck said. "Our biggest problem is hiring great people."

*April 13-May 12 to May 13-June 12, 2007*

Most significantly increased word pairs for the month beginning April 13, 2007 to the one beginning May 13, 2007 were:

juliet avatar

mike avatar

avatar sex

sex Juliet

like sexual

mike avatars

mike sex

talk sex

very realistic

virtual juliet

This is also the period in which the two series, positivity and number of stories became synchronized. The framing of the stories was about sexual activity in Second Life. Figure 5 shows the word-network surrounding “Second Life.”

Figure 5 about here

Here is an exemplary story that received wide television showing on NBC  
television stations:

:

June 11, 2007 Monday

Show: 11:15 AM KUSI

>> Mike: does this get dangerous with all the research? >> in my experience,  
No. It's the opposite. It's release for fantasy. You can go on there do  
Something like maybe S&M that could be violent in real life but it's fantasy  
Release. >> Juliet: this brings up the whole thing, whole issue of my husband  
Spending a lot of time on the computer. His little avatar is having sex with  
Another little avatar. >> mike: are you jealous for this avatar. >> Juliet: I'm  
Jealous of this avatar. Do you find that you met men who are in relationships  
Who are tied up. >> well, obvious lie there's married people who are single in  
Secondlife. Sickle people who are married in secondlife. >> Juliet: I've dated  
Some. >> and your avatar can actually get married in secondlife and get  
Divorced and have a baby. >> mike: this is the ultimate imaginary friend. >> it  
Really is. Like, for example, I met someone, we became really good friends,

Talked all the time, he was a guy and I was actually going through some problems  
In real life at the time. And so first we met, obviously really casual just like  
With any friendship then you become deeper and deeper and more connected. I was  
Telling him about my personal life, my real life. He's talking to me about his  
Troubles with his wife and stuff like that. Then one day all of a sudden he  
Sends me an IM like I need to tell you -- >> Juliet: instant message. >> I need  
To tell you that I'm actually a woman. >> mike: I knew it. Does that upset you?  
>> oh, yeah. It pissed me off. >> mike: it does? >> well -- >> mike: does an  
Avatar cry? >> this is -- because for me I was now good friends with this  
Person. >> Juliet: good friends with the avatar. >> people would say, it's not  
Real. But I think people find this so compelling that they may fall in love with  
Another person and that person is real to them but of course it's a fat see  
Person. Your real spouse can't be that perfect. >> Juliet: it's no different  
Than chat rooms or online dating. >> it has enhanced -- just a figure. >> mike:  
Is it cheating? Does it get to that point? >> it could. >> sure. First of all  
Cheating is in the eye of the beholder unethical behavior is regardless of what  
Media. For most of my career don't we need new law to deal with this new  
Technology. My response has largely been, no, the law is ancient and well  
Prepared. However, now that we have 3d worlds we have the ability to sort of  
Interact with people in a very real way which zone tirely decoupled from the  
Geography. We don't need to be in physical proximity. If you walked into a club  
Somebody approached with you a bulge and glass of champagne said, come down to  
The basement you'd say, go away, person. You would be able to do that. Or if  
Someone were actually man you'd probably figure that out or woman who what have  
You figure that out fairly quickly, in most cases. Not true on the internet. The  
Law may very well be unprepared to deal with some of these dynamics because they

Are unprecedented. >> mike: this is fascinating. >> Juliet: it is. I never  
 Thought we'd get into this discussion. This is happening. >> mike: let's create  
 Avatars. I want to talk to bonnie. Thank y'all very much. >> Juliet: I'll talk  
 To jean Anne. >> mike: I can finally be a woman. >> Juliet: for more information  
 On virtual worlds log on to mike: I'll become Juliet you  
 Become mike. >> Juliet: are you kidding me. >> mike: a frightening world. Come  
 Back in 90 seconds everybody. >> announcer: still to come -- why Callie Thorn  
 Likes to play with fire on "rescue me." plus -- our favorite wedding crashers  
 Jessica quiche son and chuck nice check out wedding essentials of the fabulously  
 Wealthy you have to see to believe. Up next, meet the father and son doctor duo  
 Declaring war on obesity. What's their secret weapon.

## Discussion

This research shows it is feasible to efficiently collect large volumes of documents about news topics, in this case about Second Life, using the recently revised LexisNexis Academic search engine options, which now allows downloading 500 stories at a time rather than a single story per download. For story topics such as Second Life in which there is relatively frequent coverage but less than 998 stories per month, it is recommended that times periods no longer than one month be used because above that the number of stories can exceed maximums and those displayed will be only the first 998. If for some months the coverage exceeds 998, one can break those months into



smaller segments to get under the 998 ceiling for each, and then aggregate the data back to the monthly period.

This study has demonstrated how the computation of the positive/negative emotion ratio across news stories can be automatically computed using LIWC 2007 and then be overlaid on the coverage time series to observe the occurrence of phase shifts in their association. Then, we have shown that the adjacent months during these phase shifts and/or jumps in coverage can be examined using word-network analysis to reveal story framing that may account for these shifts.

At another level, the results reveal that by graphing the number of stories about a news topic over time, where one finds key points in the curve in which the number of stories jumps, the stories can be word-network analyzed with semantic network analysis and statistical comparisons made for adjacent months to determine which word pairs are significantly more frequent. With these pairs, stories can then be found that contain them. These stories can be assumed to be instrumental in the increase of media hits.

This study has also shown that Nodetric (Author, ) can be effectively and efficiently used to select all nodes surrounding a target node, in this case Second Life and linked up to five steps away. By dropping low order frequencies the graphs become more readily interpretable. Such information gives evidence of the details of story framing

.

### **Limitations**

Although the use of the search term: caps(Second Life) restricted retrieved articles to those in which the phrase Second Life occurred with some words capitalized there were some stories captured that were from TV transcripts that used the term in other

ways. TV transcripts are presented in all capital letters. So for example, a person who got a Second Life after release from prison, if covered on television, was captured with the search term. This requires looking at each story to eliminate false hits. Time did not permit this culling in the current research.

### *Theoretical Implications*

Substantively, the most theoretically interesting finding concerned the phase shifts between emotionality and amount of coverage. Future work that seeks to explain such processes, provided they are replicated, can contribute to improved understanding of media coverage change. Our current analysis showed that there was one major framing shift that caused the two time series of positivity and number of stories to become synchronized, although negatively. In this phase it was the framing of Second Life as an environment of value to corporate interests. Then, we found that a framing shift to virtual sex in Second Life was associated with a second phase shift, an inversion in the synchronized series such that the direction of association flipped to become positive with the greater the positivity, the greater the news coverage. These findings provide new insights into phase shifts of media coverage in relation to content features, indicating how a new area of continued coverage matures and transforms. Very different fundamental relationships between the content attributes, in this case emotionality, and the coverage curve, appear over the two-year series. If one does not do such time-series framing studies this analysis shows that the result would be a finding of no linear relationship between story emotionality and amount of coverage, when in actuality there were theoretically interesting periods in which the basic relationship was very different.

To summarize, this study embodied the goal of exploring the use of several tools for media frame research, analyzing time-series of news coverage about topics, beginning with the startup period through the take-off period. The first tool is mapping of the number of news stories across a variety of media, newspapers, television, blogs, web pages, and other media. Next we explored statistical content analysis of each month of news stories to compute the positive/negative story content ratio. Third, we overload this emotional content curve with the amount of coverage curve and looked for major shifts in the nature of the basic relationship. Finding several of these, we then performed a word-network analysis of the stories in adjacent months and examined changes in word pairs from these networks to see what significant differences there were that characterized a shift in the framing of the news stories.

More specifically, in this preliminary analysis case of analyzing secondary documents about the 3-D virtual reality social networking site of Second Life we found that once coverage shifted framing to emphasize corporations' entry into Second Life, the series for positivity and coverage became synchronized, albeit negatively for a two month period. Then a framing shift to virtual sex in Second Life inverted the synchronization of the two series such that as positivity of emotional news coverage changed the amount of coverage increased or decreased. After the inversion, more positive coverage was associated with more coverage, while more negative coverage was associated with less coverage.

This analysis demonstrated how empirical analysis of a moderately long series of news stories spanning two years and beginning with the launch of coverage through its take-off period on the diffusion curve, by combining two forms of content analysis, one

for the ratio of positive to negative emotion in the coverage, and the other the word-networks surrounding major change periods, can reveal how story framing may be associated with shifts in amount of coverage and the alignment of news content with amount of news coverage over time.

### *Future Directions*

The methods of statistical content analysis to produce word-networks from relevant documents provide a means to operationalize story framing. Hypotheses can then be tested using variations in framing as well as variables measuring various structural properties of the word-networked content of secondary sources about a topic. Future hypotheses can test whether our findings of changes in story framing predict phase shifts in the relationship between the positivity of news coverage and the amount of it over time. If such patterns are replicated or different patterns are found there are implications for theoretical advancement in the media framing literature.

## Works Cited

- Ashley, L. and Olson, B. (1998). "Constructing reality: Print media's framing of the Women's Movement, 1966 to 1986," *Journalism & Mass Communication Quarterly*, 75(2): 263-277.
- Batagelj, V., & Mrvar, A. (2007). *PAJEK program for large network analysis* [computer program]. Ljubljana, Slovenia: University of Ljubljana.
- Borgatti, S.P., Everett, M.G. and Freeman, L.C. (2002). *UCINET 6 for Windows* [computer program]. Harvard, MA: Analytic Technologies.
- Burt, R.S. (1992). *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press
- Dearing, J.W., & Rogers, E.M. (1996). *Agenda-setting*. Thousand Oaks, CA: Sage.
- Diesner, J. & Carley, K.M. (2004). Revealing social structure from texts: Meta-Matrix text analysis as a novel method for network text analysis. In V.K. Naraynan, & D.J. Armstrong (Eds.), *Causal Mapping for Information Systems and Technology Research: Approaches, Advances, and Illustrations*. Harrisburg, PA: Idea Group Publishing.
- Duszak, A. (1993). On variation in news-text prototypes: Some evidence from English, Polish, and German," *Discourse Processes*, 19(4): 465-483.
- Entman, R.M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication* 43 (4), 51–58.
- Entman, R.M. & Rojecki, A. (1993). Freezing out the public: Elite and media framing of the U.S. anti-nuclear movement. *Political Communication*, 10, 155-173

- Hibbs, M. (1993). *Semantic framing of news about U.S. trade policy: 1982 to 1992*. Dissertation: \_\_\_\_\_.
- Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. New York: NYU Press.
- McCombs, M.E., & Shaw, D.L. (1972). The agenda-setting function of mass media. *The Public Opinion Quarterly*, 36(2), 176-187.
- Miller, M., Andsager, J.L. and Riechert, B.P. (1998). Framing the candidates in presidential primaries: Issues and images in press releases and news coverage. *Journalism & Mass Communication Quarterly*. 75(2): 312-324
- Pennebank, J.W., Booth, R.J., & Francis, M.E. (2007). [computer program]. *LIWC 2007: Linguistic Inquiry and Word Count*. Austin, Texas. liwc.net
- Reese, S.D., Gandy, O.H., & Grant, A.E. (2001). *Framing Public Life PR: Perspectives on Media and Our Understanding of the Social World*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Richards, W.D. Jr. (1986). The NEGOPY network analysis program. *Connections*, 76-83.
- Richards, W.D., Jr., & Seary, A. (2007). *MultiNet*. [computer program]. Burnaby, BC, Canada: Simon Fraser University.
- Van Dijk, T.A. (1988). *News as discourse*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Scheufele, D.A. (1999). Framing as a theory of media effects. *Journal of Communication*, 49(1): 103-122.

Scheufele, D.A. (2000). Agenda-setting, priming, and framing revisited: Another look at cognitive effects of political communication. *Mass Communication & Society*, 3(2/3): 297-307.

Shoemaker, P. J. & Reese, S.D. (1996). *Mediating the message: Theories of influences on mass media content (2nd edition)*. White Plains, NY: Longman.





Figure 2.

Positive/Negative News Content in Relation to Amount of Coverage

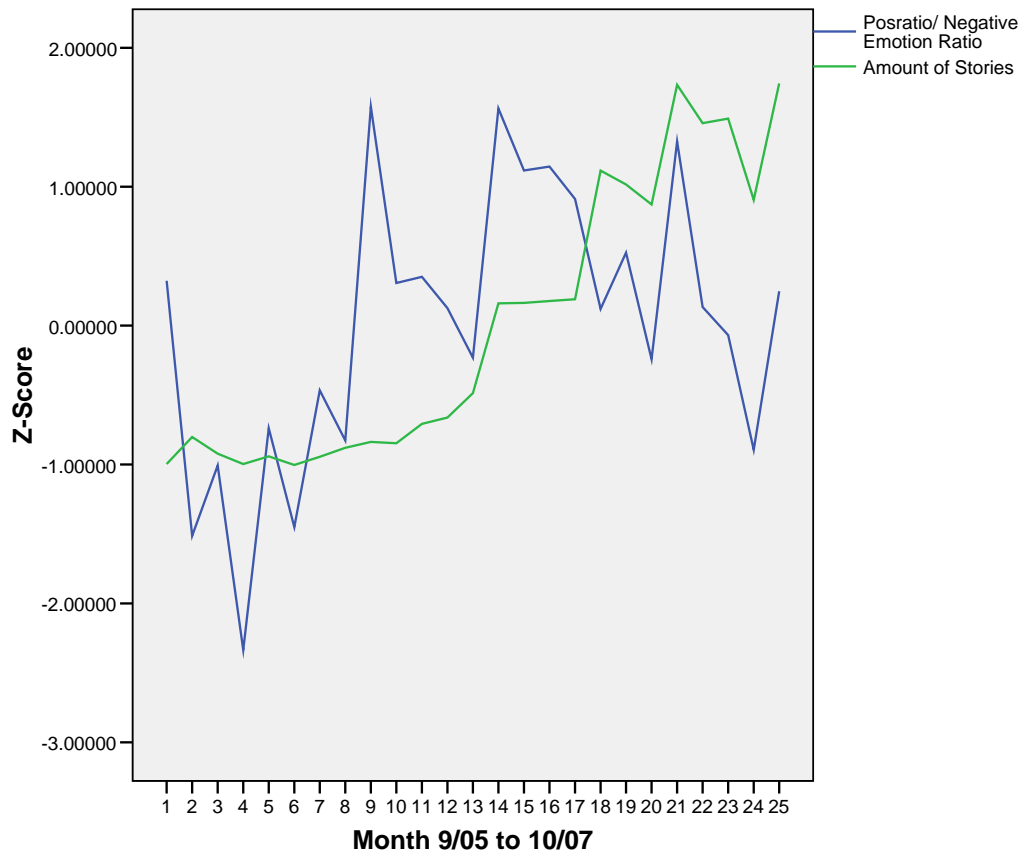


Figure 3.  
Graph of Word Network surrounding Second Life at Frequencies Greater Than 25 for  
October 13 to November 12, 2006

