# Measuring Cross-Cultural Stimulus-Responses on the Internet

*Edward P. MacKerrow and Jennifer H. Watkins*

Center for the Analysis of Emerging Threats,
International Applications and Technology Division
Los Alamos National Laboratory, Los Alamos, NM 87545

## ABSTRACT

The Internet is now an accepted form of discourse around the world on subjects ranging from the mundane to the serious. Weblogs, chat rooms, and forums provide a new source of data on attitude diffusion and opinions to events across the world. In addition to providing valuable data for social science research, the Internet is allowing new forms of social and political behavior to occur. In this paper we present initial research on measuring the rate of Internet activity to key events over time. We present measurements of stimulus-response temporal dynamics using open-source free web analysis tools.

**Keywords**: blog analysis, Internet social science, attitude diffusion, opinion swarms, weblog, web analytics.

## INTRODUCTION

Events can stimulate discussions on the Internet. People often provide comments and opinions on weblogs ("blogs") and web forums (Hewitt, 2005). It is expected that some events will have more responses than others. We are currently attempting to characterize the relationship between event types and their associated Internet responses. The response we measure at this point is simply whether or not a given blog discussion included mention of a specific event.

Our goal is to characterize the Internet response along the dimensions of:

- The temporal shape of the response including the rise time, response pulse width, and decay time.
- A "pulse" shaped response versus a periodic or cyclic response.
- The amplitude (*i.e.* number of blogs mentioning the search term(s)) of the response in terms of percentage of all blogs posted during the same time period.
- The geographic areas of the respondents (we discuss the current limitations in measuring geo-spatially identified responses later).

An example measurement of an Internet response pulse is shown in Figure 1. Our definitions of pulse characteristics are displayed in Figure 1.

The measurements of blog activity on a particular topic are made using keyword search tools. It is possible to accidentally register blog discussions that are not semantically relevant to the topic of search. For example, searching on the term "explosive" with the search engines can find both the phrases: *"… the explosive (noun) material ignited…"* and *" … the tennis player hit the ball with explosive (adjective) force…"* as being a positive "hit". The events we searched for had a large enough response population that these spurious situations introduced a small error. This would not necessarily be the case for obscure events having low numbers of Internet responses.
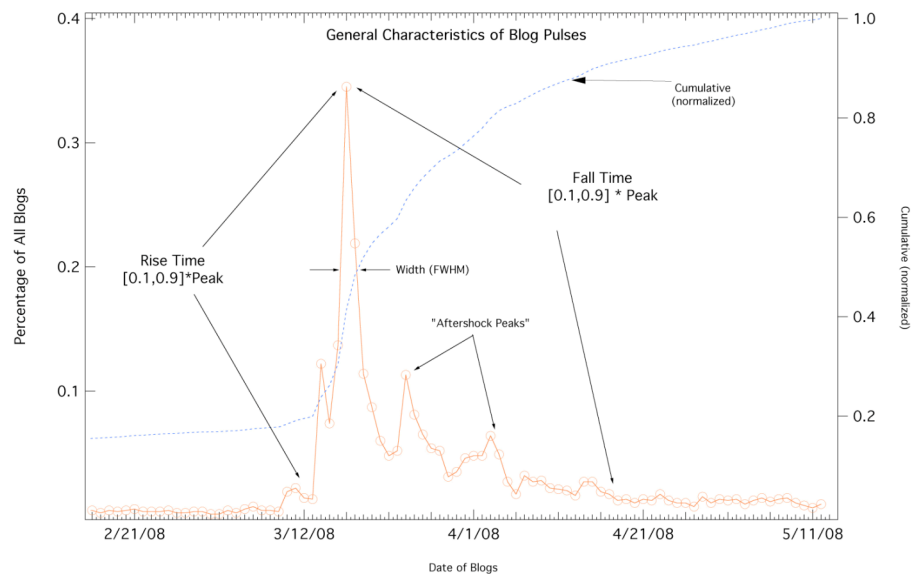


FIGURE 1. A sample blog pulse is shown here with the definitions of pulse characteristics we measured. The left vertical axis is the amplitude of the Internet blog response and right vertical axis is the normalized cumulative rate of response over time.

Measuring Cross-Cultural Stimulus-Responses on the Internet

**TYPES OF INTERNET STIMULI**

Many different types of events will trigger discussions on the Internet. For example:

- Physical events (*e.g.* hurricane, earthquake, tsunami, *etc.*)
- Statements made (normally by political elites or celebrities).
- Policies (*e.g.* new taxes, laws, regulations)

Some of these are "impulse events" that occur over a short time interval (*e.g.* a hurricane), whereas others are "ongoing events" (*e.g.* political campaigns). The Internet responses are expected to reflect the time structure of the event – discussions on old news eventually die off.

The set of events we analyzed as Internet stimuli for this initial study included:

1. During the ABC democratic debates on April 16th, 2008 Hillary Clinton stated that an attack on Israel by Iran would result in "massive retaliation" from the US (CNN.com, 2008).
2. The March-April 2008 collapse of The Bear Stearns Companies, Inc. investment bank (PBS.org, 2009).
3. Pope Benedict XVI April 2008 visit to the US (Goodstein, 2008).
4. The March 2008 ABC News reports on selected excerpts taken from past sermons of Reverend Jeremiah Wright, former pastor for President Barack Obama (Ross & el-Buri, 2008).

Temporal measurements were made of Internet blog discussions in response to these events.

Geospatial analysis, determining where the bloggers are located, is more difficult than temporal analysis. Tools and methods do however exist to locate IP addresses[1] of the *web servers* used to host the blog websites. These tools do not provide exact location information on factual people posting to a blog. For example, a server located in New York could be hosting a weblog focused on financial markets in Asia – with the majority of bloggers living in Asia. Often there can be some correlation between the topic of discussion and the location of bloggers, since people are often more interested in news that affects them locally (Hewitt, 2005).

It is possible to measure information on the location of Internet *searches*, instead of blog postings. Geospatial information can be measured on web searches using Google™. To do this we used the Google Insights™ tool[2]. Although Internet searches (collecting information) are different than blog postings (expressing

---

[1] See, for example, http://www.whatismyip.com

[2] Available at http://www.google.com/insights/search/#

opinions), the searches can be used as a proxy for measuring interest in a particular topic or event. Search data provides no information about attitude or opinion though.


## METHODOLOGY USED TO MEASURE INTERNET RESPONSES

Our initial research presented here relied on two blog search engines, Technorati™[3] and BlogPulse™ Metrics™[4]. To use these tools you merely enter search terms that you are interested in, and the tools return a time series of all blogs within a specified time period that discussed these search terms. Example measurements are shown in the next section.

In order to measure the geospatial "search interest" in a particular topic or event we utilized the Google Insights™ tool to analyze which regions of the world Internet users searched for a given term or phrase.


## MEASUREMENT RESULTS

Temporal analysis of blog activity is shown in this section for the four events analyzed. In Figure 2 we show the blog activity in response to Hillary Clinton's 2008 comments expressing possible retaliation against Iran if they were to attack Israel. Clinton made multiple public comments relating to this topic during her 2008 Democratic presidential campaign. From the data it appears that Clinton's statement "obliterate Iran", that followed her initial statement of "massive retaliation", spawned a blogger response three times higher than the initial response.

---

[3] Available at http://technorati.com
[4] Available at http://www.blogpulse.com

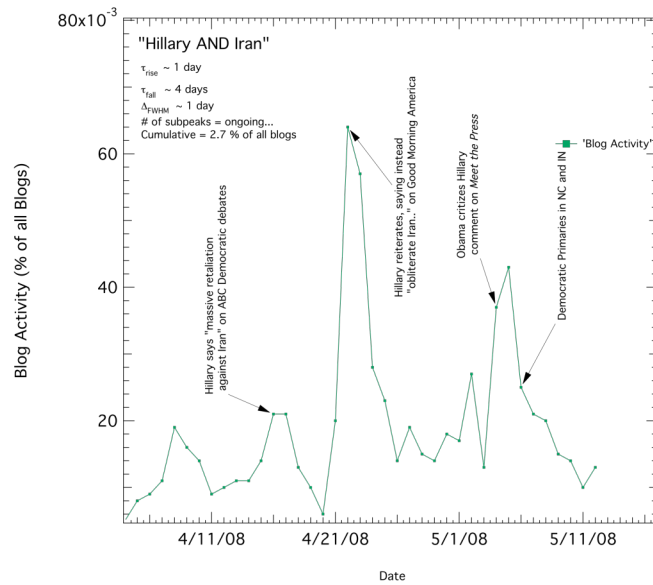# Measuring Cross-Cultural Stimulus-Responses on the Internet



FIGURE 2. The blog activity rate is shown in this figure in response to Hillary Clinton's initial comment during the 2008 Democratic debates "That there would be massive retaliation against Iran if Iran ever attacked Israel". The blog activity increases dramatically days later when Clinton rephrased her comment to include "obliterate Iran".

The geospatial analysis of Internet *search* activity related to Hillary Clinton's comments is shown in Figure 3 where it can be seen that the US, New Zealand, South Africa, and Canada had the most Internet *search* activity related to Clinton's campaign comments.

FIGURE 3. The geospatial Internet search activity for Hillary Clinton's comments on obliterating Iran if they attack Israel is shown here for the time period of March 2008 to May 2008 using the Google Insights™ tool. The time series for each independent search term is also shown.

The financial collapse of The Bear Stearns Inc. investment bank is shown in Figure 4. The initial triggering event was the Goldman Sachs announcement that they would not cover Bear Stearns derivatives. The blog response pulse to this was relatively low in amplitude as compared to the subsequent events.

# Measuring Cross-Cultural Stimulus-Responses on the Internet
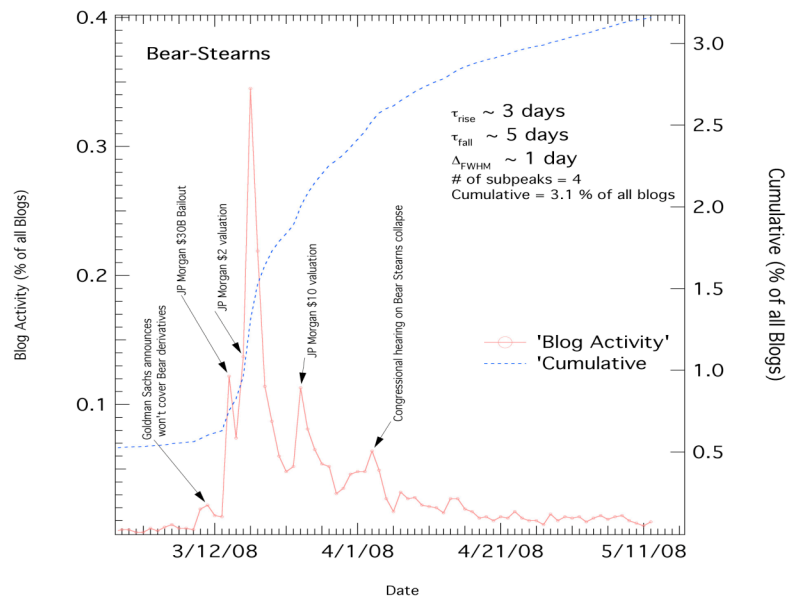


FIGURE 4. The blog response to the collapse of The Bear Stearns investment bank is shown here. It is interesting to observe the initial blog pulses that precede the huge blog storm when JP Morgan devalued Bear Stearns.

The visit of Pope Benedict XVI to the USA was also analyzed. This event differs in the others analyzed since it was not considered to be a "crisis" or a political point of contention between different political or social identity groups (see Figure 5).
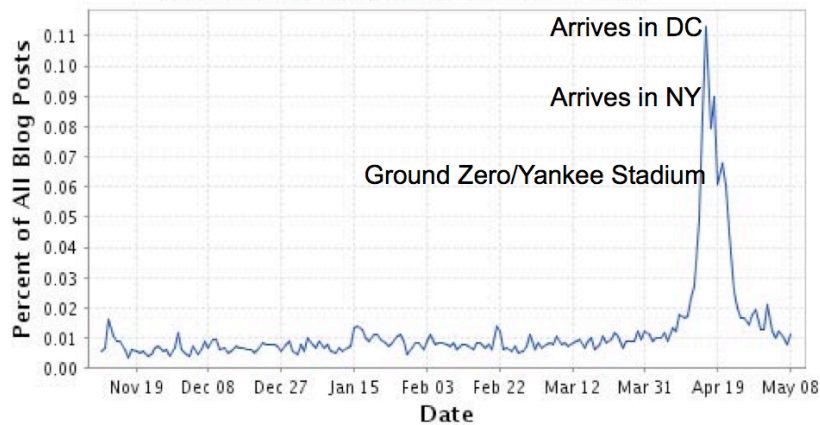


FIGURE 5. The blog activity surrounding the time period when Pope Benedict XVI visited the US in 2008 is shown. This is an example of an "impulse event".

Blogging associated with political muckraking during campaign time appears to trigger what are known as "opinion storms" – many people going onto blog sites and expressing their opinions (Hewitt, 2005). This is to be expected since blogs do provide a channel for people to express their opinions to a wide audience. An example of this type of blog activity is shown in Figure 6 for the Reverend Wright controversy during President Obama's 2008 campaign.
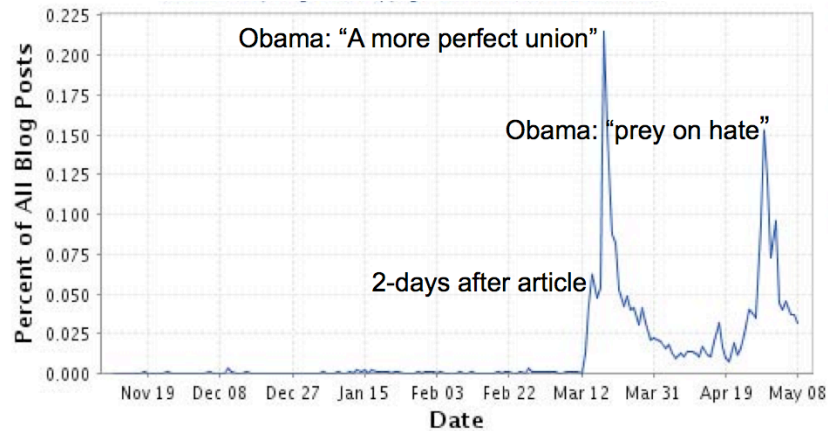


FIGURE 6. The blog activity in response to an ABC published article on excerpts of past sermons of the Reverend Wright, an early pastor of President Obama is shown here. The geospatial activity of Internet *searches* related to this controversy is shown in Figure 7.

The geospatial Internet *search* activity related to the Reverend Wright controversy is shown in Figure 7 for the USA. Heterogeneous activity levels are seen across different states in the US. These state search activity patterns can be compared to the map of red/blue election result states shown in Figure 8. There appears to be a correlation between blue states and states using the Internet to search for information on the Rev. Wright controversy.

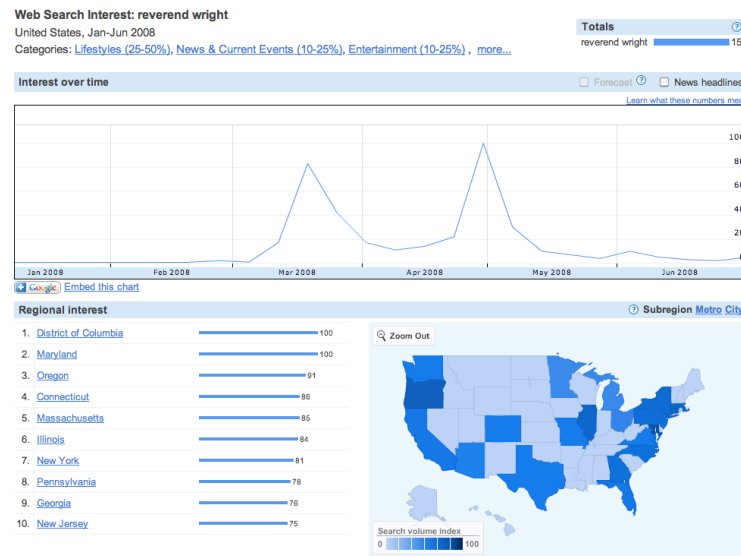# Measuring Cross-Cultural Stimulus-Responses on the Internet



FIGURE 7. The activity of Internet *searches* related to the Reverend Wright, Barack Obama controversy is shown here. The two temporal peaks correlate with the two peaks in Figure 6 (the 2008 election Red/Blue states are shown in Figure 8).
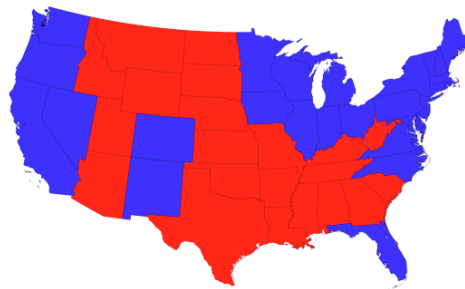


FIGURE 8. The 2008 US presidential election map showing the Republican (red) and Democratic (blue) majority states is shown here for comparison sake with Figure 7.

## SUMMARY

The Internet can be used to measure "opinion storms" over time. We did observe well-defined response pulses to different types of events using freely available Internet analysis tools. These useful tools allow for the analysis of attitude diffusion over time.

Geospatial analysis of blog activity is currently underway and is proving to be more difficult and less accurate than temporal analysis of blog activity. The reasons are fundamental: bloggers post comments to a weblog which is hosted on a server

located anywhere on the Internet. It is possible to measure the server locations based on their IP address. This does not however define where the blogger is located. A very popular blog might have posters from all over the world submitting comments and posts to it.

Estimates of geospatial Internet *search* activity are possible using the Google Insights™ analysis tool. This useful analysis tool provides search activity analysis down to the city level in the USA. The Google Insights™ tool also allows the analyst to observe the geospatial-temporal search activity unfold over time with a time-slider interactive map, allowing for visualization of opinion diffusion.

Determining *who* the individual blog respondents are is not possible with current tools, and will perhaps never be realized given the expected anonymity of bloggers and the levels of separation between the bloggers themselves and the servers hosting them.

The leading edge of the blog pulses ("rise time") was found to be very short in duration for the events analyzed – the initial blog response to a given event is very rapid. Real world events are often followed by subsequent related events (*e.g.* a politician makes one statement, the blogosphere reacts to it, then the politician makes follow-on statements). Measurements of blog pulses must take this into account – the analysis of the Bear Stearns collapse is an example where the large peak is actually composed of a sequence of closely related events and press releases over time.

The falling edge of blog pulses tended to be much slower than the rise times, however for many events we analyzed the discussions on blogs died off after approximately one week. Perhaps the majority of active bloggers may find newer events more interesting to discuss. When someone posts old news to a blog they are often "reprimanded" by the other bloggers since the topic has already been discussed. Social interactions on the Internet are important drivers to the behavioral norms of bloggers.

In order to accurately measure how different cultures respond to an event we need to improve our ability to geo-locate blogger responses. Currently we can geo-locate the regions where people are *searching* for event specific terms. At this point in our research we cannot make any conclusions as to the correlation between *blogging* on a particular topic and *searching* for a particular topic. Our current belief is that opinions should only be "measured" via blog analysis, since just because a person searches for a particular topic does not mean they have a strong opinion either way on that topic.

Since blogs provide an anonymous platform for many to express their opinions, they can capture attitude dynamics in a relatively new manner. Politicians, corporations, and influence groups can use blogs as important influence channels. The large number of Internet users available to counter/correct specific claims being broadcast on blog sites act as a collaborative editing mechanism.

# REFERENCES

CNN.com (2008, May 4). *"Obama: Clinton's 'Obliterate' Iran Statement Too Much like Bush"*. Cable News Network. Retrieved March 1, 2010 from <http://www.cnn.com/2008/POLITICS/05/04/dems.election>.

Goodstein, Laurie. (2008, April 14). The NY Times. *"Uncertain Church Awaits Pope in U.S."* Retrieved March 1, 2010 from <http://www.nytimes.com/2008/04/14/us/14church.html>.

Hewitt, H. (2005), "Blog: Understanding the Information Reformation That's Changing Your World", Nelson Publishing, Nashville.

PBS.org (2009, February 17), Frontline Video, *"You've Got A Weekend to Save Yourself"*, Retrieved March 1, 2010 from <http://www.pbs.org/wgbh/pages/frontline/video/flv/generic.html?s=frol02s1f81q752>.

Ross, B., and Rehad el-Buri (2008, March 13), *Obama's Pastor: God Damn America, U.S. to Blame for 9/11, ABC News*, Retrieved March 1, 2010 from <http://abcnews.go.com/Blotter/story?id=4443788>.