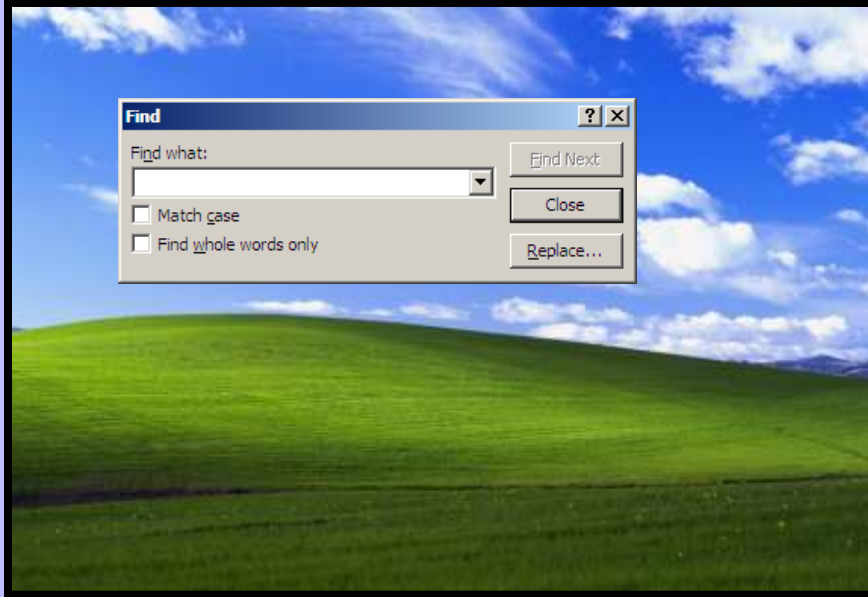


Quantifying the Performance Effect of Window Snipping in Multiple-Monitor Environments



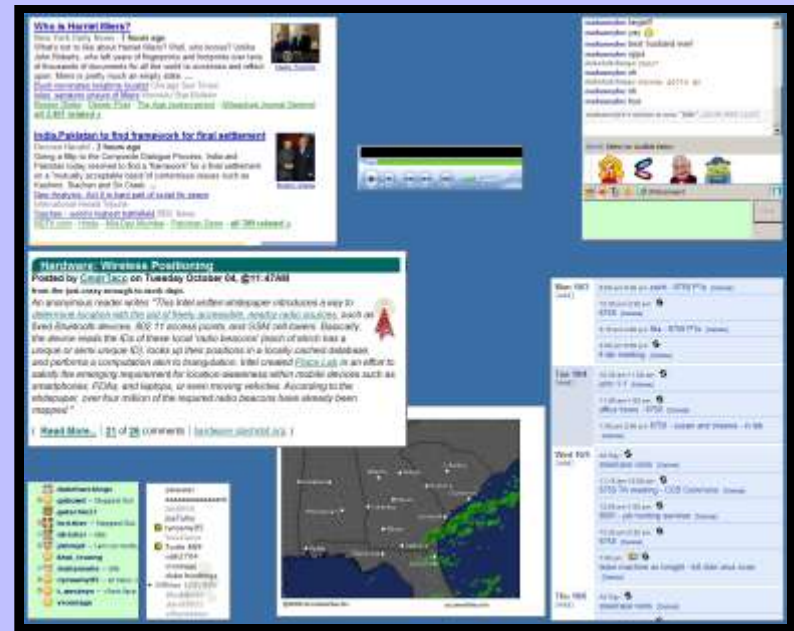
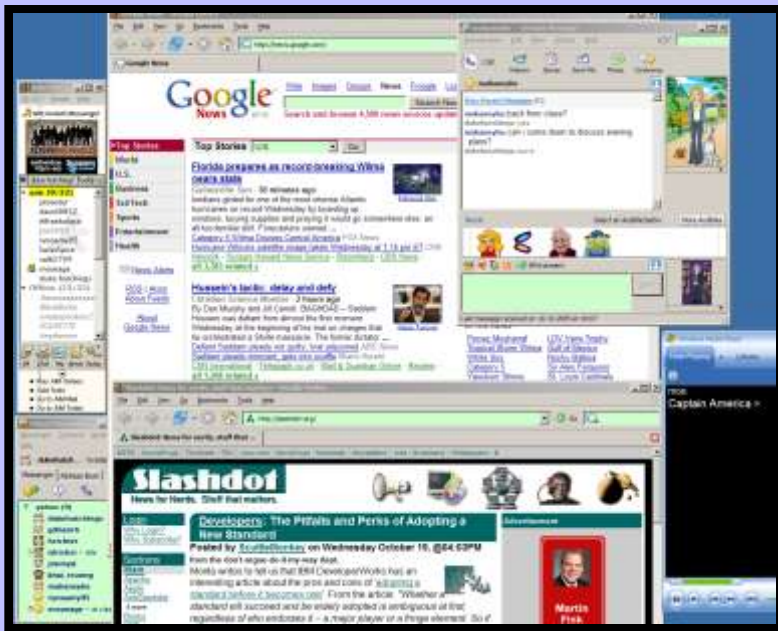
Duke Hutchings
John Stasko

Multiple-Monitor Environments



Window Snipping – DEMO

Many Snips...



Field Observations

- Created more visible windows with Snip
- Concentrated snips on a “reference monitor”

What can multiple monitor users expect to gain by snipping windows for reference?

Study Setup

Recruiting

- Word of mouth and face-to-face requests
- Participants must be fluent in English
- Participants must not have used Snip before

Equipment

- Standard desktop computer running Windows XP
- Two monitors side-by-side, new dual-monitor card
- 17" LCD displays at 1280 × 1024 pixels, landscape

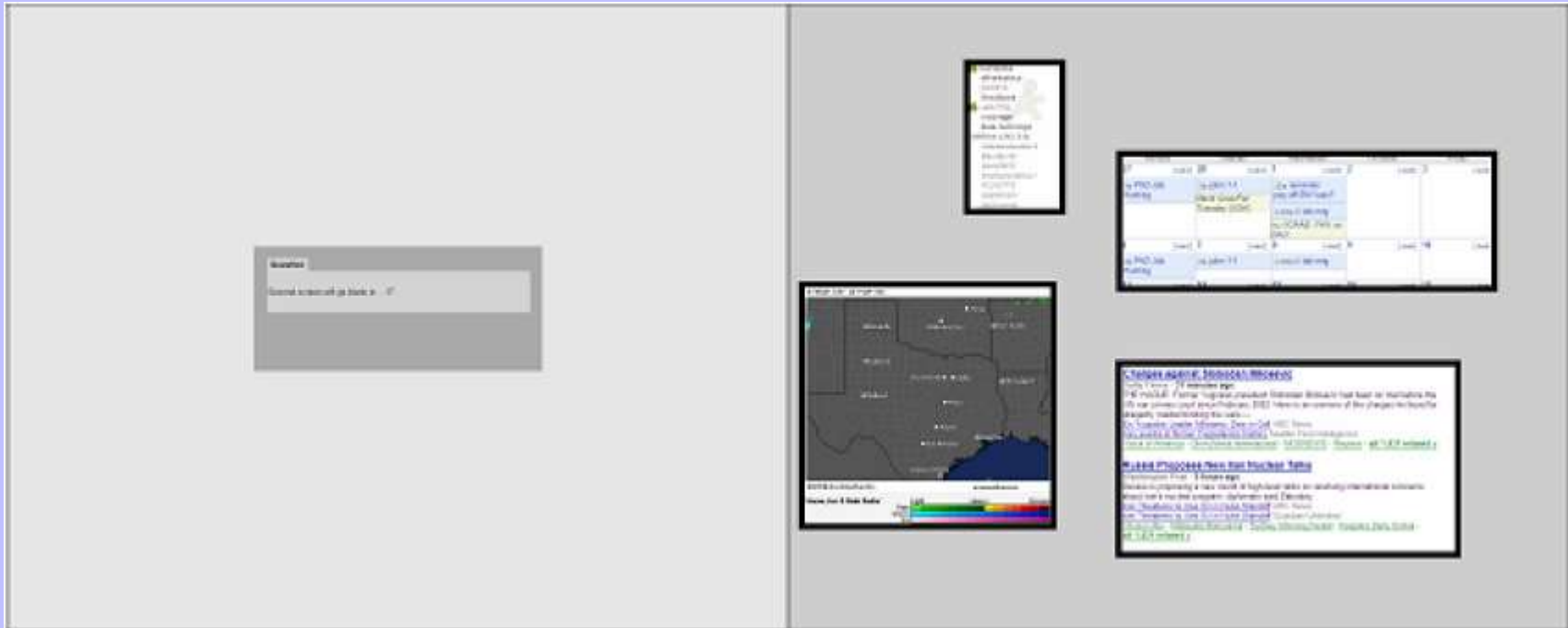
Setup

Experiment Phases

- Snip phase
- Arrange Phase
- Reference Phase

- Brief Interview

Reference Phase



Reference Phase



Reference Phase

The image displays a reference phase interface, likely for a search engine or data analysis tool. It is divided into several sections:

- Search Box:** A central input field with the placeholder text "Enter your search criteria here" and two green buttons labeled "True" and "False".
- Map:** A map showing a geographical area with various regions and a color-coded legend at the bottom.
- Navigation/Filter Panel:** A vertical list of options on the left side, including "Home", "About", "Contact", "Help", "Privacy", "Terms", "Feedback", and "Advanced Search".
- Data Table:** A table with columns labeled "Date 1", "Date 2", "Date 3", and "Date 4". The rows contain data points, possibly representing different time periods or categories.
- Text Panel:** A panel containing text, likely a description or instructions related to the search or data analysis process.

Reference Phase



Reference Phase

The screenshot displays a software interface with a light gray background. On the left side, there is a search bar with the text "Search" and "Contains: Terms and parameters in the". Below the search bar are two green buttons labeled "True" and "False".

On the right side, there are several data visualizations:

- A small vertical chart or legend at the top right, showing a list of items with colored markers.
- A larger map or chart in the middle left, showing a geographical area with various markers and a color scale at the bottom.
- A table or grid of data points in the middle right, with columns labeled "Date 1", "Date 2", "Date 3", and "Date 4". The table contains numerical and text data.
- A text box at the bottom right, containing a title "LARGE SCALE PROCESS MODELS" and several lines of text, including a URL "http://www.earth.berkeley.edu/~jacob/".

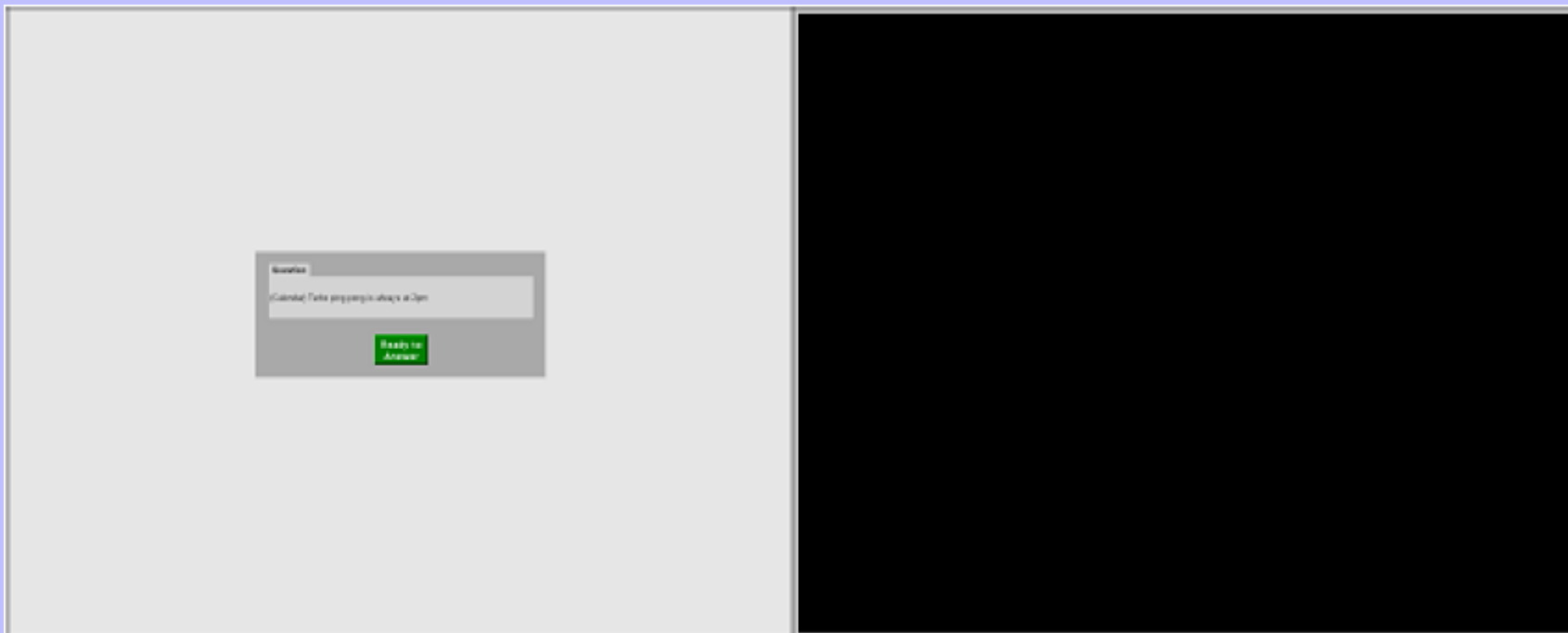
Reference Phase

The image shows a screenshot of a web browser displaying the Google News homepage. The browser's address bar shows the URL <http://news.google.com/news/edition>. The page features the Google News logo and a search bar. The main content area is titled "World" and lists several news stories:

- Charges against Lebanese Hizbullah:** Daily Times - 30 minutes ago. The HACJIB, former Hezbollah president, had been arrested before the UN ceasefire took effect in February 2002. Here is an overview of the charges he faced for allegedly sponsoring the attack...
- Russia Proposes New Iran Nuclear Talks:** Washington Post - 3 hours ago. Russia is proposing a new round of high-level talks on resolving international concerns about Iran's nuclear program, diplomats said Saturday. Iran threatens to use its uranium enrichment...
- Leftist Riots in Chile for Pinochet's Imprisonment:** Reuters - 2 hours ago. Michelle Bachelet, Chile's first female president, was sworn in on Saturday before a whirlwind of anti-American's anger over her leadership, and US Secretary of State Condoleezza Rice.
- French police, rioting students clash in Sorbonne university:** Aljazeera - 1 hour ago. Police and rioting student clashed Saturday at Paris's famous Sorbonne university.

At the bottom of the page, there is a calendar for the month of November 2002, showing dates from the 1st to the 30th. The calendar includes a "Tasks" section and a "Calendar" section with various events and reminders.

Reference Phase



Reference Phase

The image displays a screenshot of a web browser window showing Google News and a calendar application. The browser window is titled "Google News" and shows the Google News homepage. The main content area displays several news stories under the "World" category, including:

- Charges against Lebanese Minister:** Daily News - 30 minutes ago. The HACUB, former Lebanese president Michel Murrad had been arrested before the UN ceasefire took effect February 2002. Here is an overview of the charges he faced for allegedly arms-trafficking the war...
- Russia Proposes New Iran Nuclear Talks:** Washington Post - 3 hours ago. Russia is proposing a new round of high-level talks on resolving international concerns about Iran's nuclear program, diplomats said Saturday. Iran threatens to Use Civilian Reactors for Weapons, UN Says - Reuters - 11/13/02 10:45 AM
- Leftist Riots in Chile for Pinochet Imposition:** Reuters - 2 hours ago. Michelle Bachelet, Chile's first female president, was sworn in on Saturday before a whirlwind of anti-democratic's charges against her leadership, and UN Secretary of Kofi Annan's Role.
- French police, rioting students clash in Sorbonne university:** Reuters - 1 hour ago. Police and rioting student clashed Saturday at Paris's famous Sorbonne university.

Below the news stories, there is a calendar application showing a weekly view for the week of November 18, 2002. The calendar includes a task list and a list of events.

On the left side of the browser window, there is a sidebar with navigation links for various news categories: Top Stories, U.S., Business, Sci/Tech, Sports, Entertainment, Health, Most Popular, and News Alerts. There is also a "World" section with a "Daily News" link.

At the bottom of the browser window, there is a "Change the Date Type" link and a "Date" field.

On the right side of the browser window, there is a sidebar with a "Share" button, a "Print" button, and a "Calendar Home" link.

Below the browser window, there is a separate window showing a calendar application. It has a "Calendar" title bar and a "Calendar Home" link. The calendar shows a weekly view for the week of November 18, 2002. The calendar includes a task list and a list of events.

Reference Phase



Reference Phase

Relevant Details

- Participants respond to 8 sets of 12 statements
- 2 sets are practice, 6 sets are timed
- 3 corresponding sets of 2, 4, and 6 windows
- “Always a piece visible” in the regular set
- No content overlap but questions are equivalent
- Balancing
 - 246, 264, 426, 462, 624, 642
 - $\frac{1}{2}$ snipped-regular, $\frac{1}{2}$ regular-snipped

Snip Phase

weather Snip X

AccuWeather.com

Local Weather Forecast
 Zipcode or City, State [Home](#) [Forecast](#) [Radar](#) [Maps](#) [New](#)

Canada | UK Ireland | World | Airport

Eastern Texas Radar
 You do not have a default location defined. [\(What is this?\)](#)

Snow Ice & Rain Radar
[\(What is this?\)](#)

5:45AM CST 12-MAR-08

©2008 AccuWeather, Inc. accuweather.com

Snow, Ice & Rain Radar

Light	Heavy	Severe
Rain		
Snow		
Ice		

Change this Radar Type: [Standard](#) | [Radar/Satellite Combo](#) | [Past 24hr Precipitation](#)

Done

Snip Phase

Relevant Details

- Participants perform 19 Snip operations
- 5 Snips are practice, 14 Snips are timed
- 7 unique windows from Reference Phase
- Snip points are given to guide Snipping

Hypotheses

Main Hypothesis

- The total time needed to respond to the statements in the Snipped sets will be significantly less than for the regular sets

Secondary Hypothesis

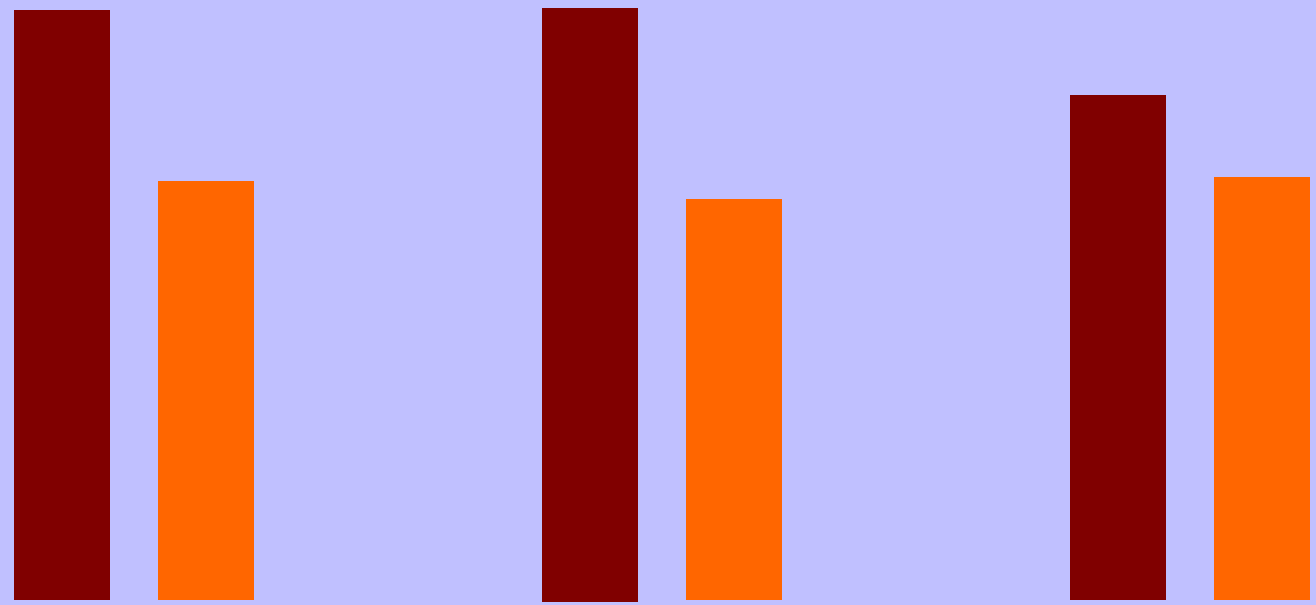
- Given that the main hypothesis holds, there will be a direct relationship between number of windows and size of the differences

Results

Participation

- 13 enrolled but one cancelled (no show)
- 12 participants (balancing needs factor of 12)

Results



	2 Windows		4 Windows		6 Windows	
	Regular	Snipped	Regular	Snipped	Regular	Snipped
\bar{x}	92.11 sec	65.44 sec	92.94 sec	62.86 sec	79.16 sec	66.28 sec
σ	25.50	20.37	21.96	16.27	18.23	20.68
p	0.0000		0.0000		0.0007	

Results

How much time did participants save?

Values are expressed in seconds per reference

	2 windows	4 windows	6 windows
Average case	2.22	2.51	1.07
“Worst case”	1.48	2.02	0.36

Secondary hypothesis not upheld

Results

Time needed to Snip a window

$T(W_s)$	Button to StartReg	StartReg to EndReg	Total
\bar{x}	1.47 sec	1.87 sec	3.34 sec
σ	0.41	0.65
$\bar{x} + \kappa$	1.55 sec	2.00 sec	3.55 sec

Results

References needed to pay off Snip overhead time

R_W			Average case		Worst case	
			<i>Region only</i>	<i>Reg + Button</i>	<i>Region only</i>	<i>Reg + Button</i>
			1.87 s	3.34 s	2.00 s	3.55 s
Average case	2	2.22 s	2 refs	4 refs	2 refs	4 refs
	4	2.51 s	3 refs	6 refs	4 refs	6 refs
	6	1.07 s	11 refs	19 refs	12 refs	20 refs
Worst case	2	1.48 s	3 refs	5 refs	3 refs	5 refs
	4	2.02 s	4 refs	7 refs	4 refs	8 refs
	6	0.36 s	32 refs	56 refs	34 refs	60 refs

Results

Discussion: Arrangement

R_W			Average case		Worst case	
			<i>Region only</i>	<i>Reg + Button</i>	<i>Region only</i>	<i>Reg + Button</i>
			1.87 s	3.34 s	2.00 s	3.55 s
Average case	2	2.22 s	2 refs	4 refs	2 refs	4 refs
	4	2.51 s	3 refs	6 refs	4 refs	6 refs
	6	1.07 s	11 refs	19 refs	12 refs	20 refs
Worst case	2	1.48 s	3 refs	5 refs	3 refs	5 refs
	4	2.02 s	4 refs	7 refs	4 refs	8 refs
	6	0.36 s	32 refs	56 refs	34 refs	60 refs

Results

Interview Notes

- Snipped sets were never overwhelming
- Felt faster with Snip than without it
- Understood mechanics of Snip, one asked for keycut
- Half said they would use every day, half occasionally

Summary

Main Hypothesis holds;
strong evidence of **time-efficiency** gain

Particularly promising for long-snipped windows...
but need to further investigate 6-window finding

Complements **space-efficiency**
gain observed in Snip field study

Future Work

- “Anti-Snip” – UI holes for privacy or constrained use
- Automation with Snip and better history mechanisms
- Impact of tools in other window managers

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