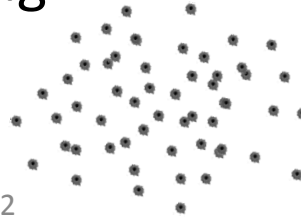


# Computer-Assisted Software Testing in Bing



WTST 12

January 2013

Harry Robinson, Microsoft

© 2013 Harry Robinson

## Manual Testing

Don't confuse manual testing  
with manual testing

Keith Stobie

**Manual vs. Automated is Hardly a Distinction**

<http://testmuse.wordpress.com>

## Automated Testing

“Automated testing”  
doesn’t mean automated testing

“Automated testing”  
means Computer-Assisted Testing

Cem Kaner  
**High Volume Test Automation**  
Keynote Address, STAR East 2004

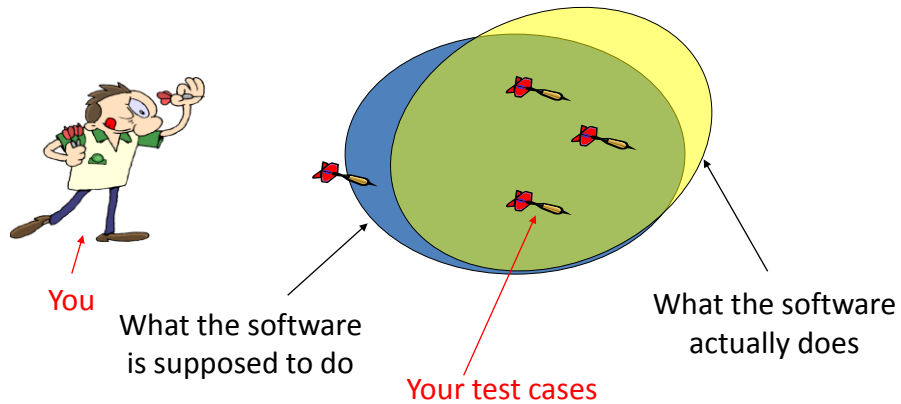
## Why Does the Distinction Matter?

What if we could create, execute,  
and evaluate scrillions of tests?

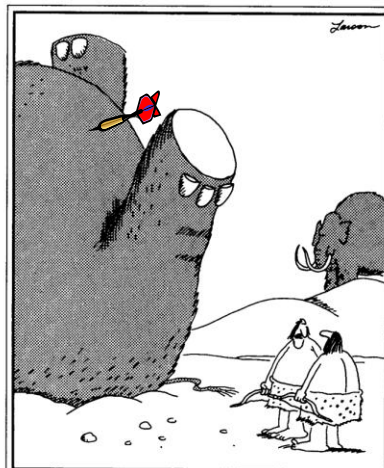
Would that change our strategy?

Cem Kaner  
**High Volume Test Automation**  
Keynote Address, STAR East 2004

## Think of software testing as a game



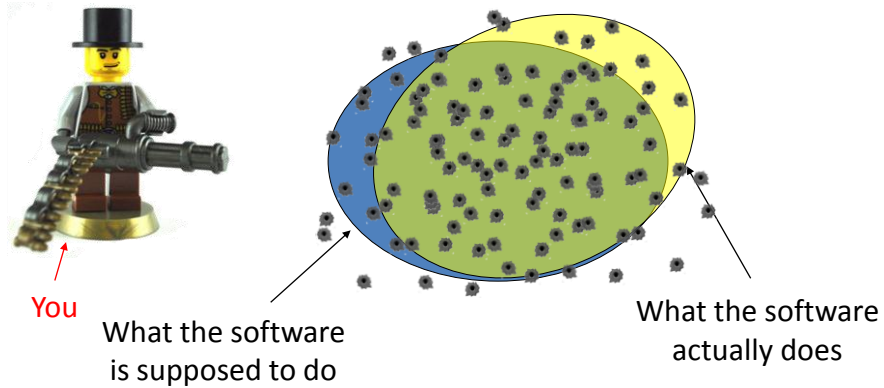
## The Art of the Counterexample



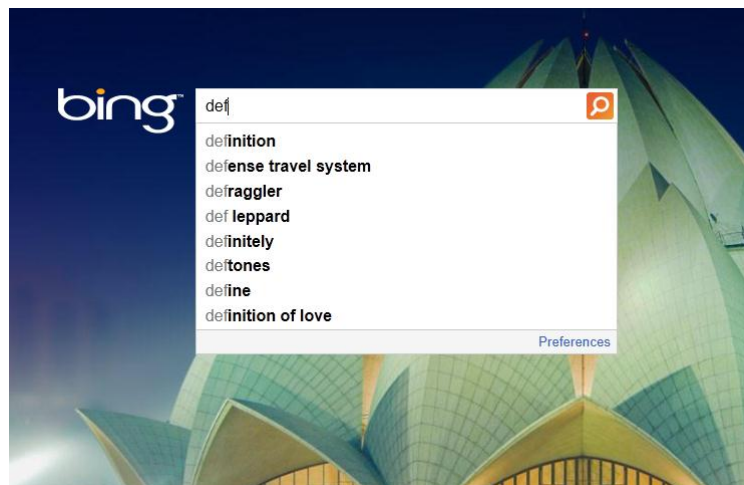
"Maybe we should write that spot down."

© Gary Larson

Think about the game again

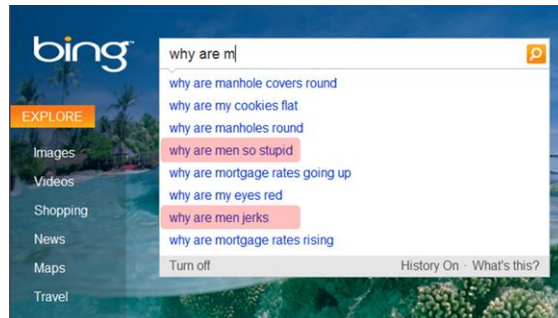


For us, it all started with Autosuggest

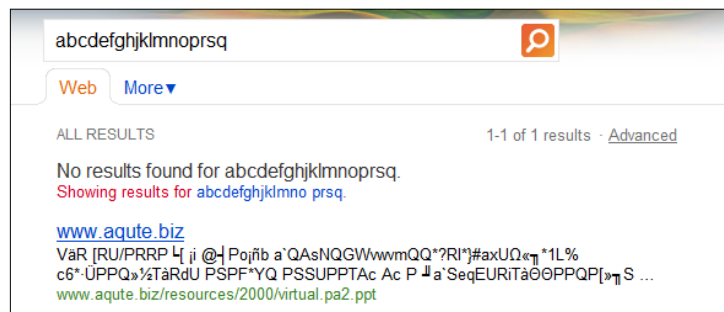




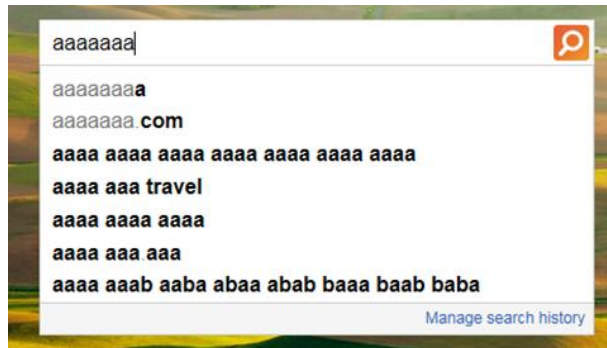
## Rule #2: Autosuggestions should be G-rated



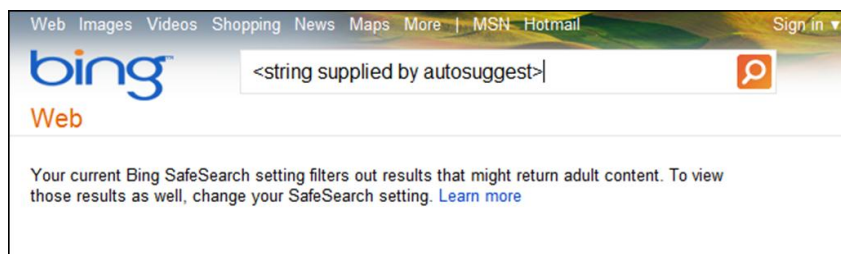
## Rule #3: Autosuggestions should not lead to empty results



#### Rule #4: Autosuggestions should not be “garbage”



#### Rule #5: Autosuggestions should not lead to adult webpages





## Curious Weather

Web Images Videos Shopping News Maps More

bing MS Beta 0

weather austin tx

**Weather in Austin, TX**  
 79°F / 48F/83F) [Data provided by iMap Weather]  
 weather austin tx

Turn on History off · Manage history

**46°F (°C)**

Wind: 7 mph SSW  
 Humidity: 76%  
 Foreca

	Today	Wed	Thu	Fri	Sat
Forecast	49° / 39°	48° / 36°	49° / 40°	51° / 41°	53° / 40°
Intellicast	45° / 37°	48° / 36°	50° / 37°	45° / 37°	46° / 36°
iMap Weather	49° / 39°	48° / 37°	49° / 41°	51° / 42°	53° / 42°

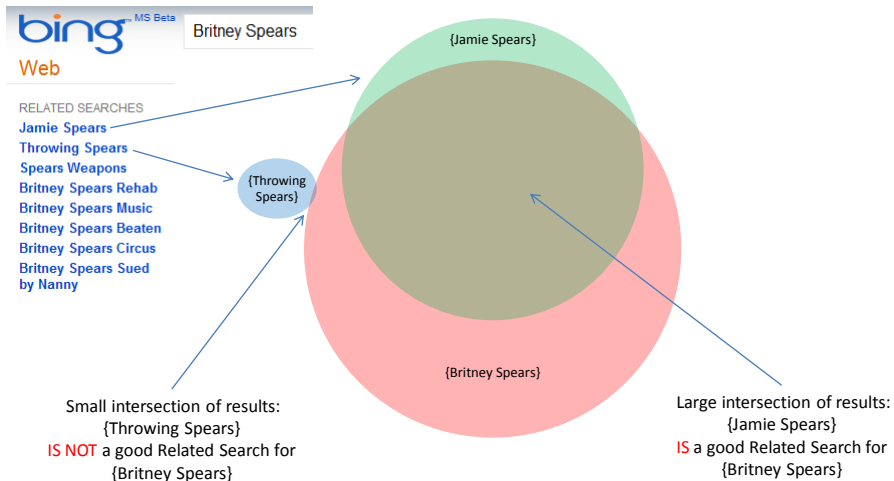
Compare 10 Day Forecast · Hourly Forecast · Weather Maps

**CATEGORIES**  
 Austin Weather **History**  
 Austin **Music**  
 Austin **Apartments**  
 Austin **Real Estate**  
 Austin Weather **Report**

**RELATED SEARCHES**  
 Austin **Doppler** Weather  
 Austin **Texas** Weather  
**News 8** Austin Weather  
**KVUE** Weather



## Testing Related Search



## Testing Answer Triggering

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0

- Run large number of queries
- Record what Answers show up
- Ask questions



Photograph by Damian Grady/English Heritage  
[National Geographic News](#)

## Which Query Triggers which Answer?

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0
James K. Polk	0	1	0	1	0	0
James A. Garfield	0	1	0	1	0	0
James Monroe	0	1	0	0	0	1
George W. Bush	1	0	1	1	1	0
Martin Van Buren	0	0	1	1	1	0
Andrew Johnson	0	0	1	1	1	0

## Why are these 4 Presidents Different?

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0
James K. Polk	0	1	0	1	0	0
James A. Garfield	0	1	0	1	0	0
James Monroe	0	1	0	0	0	1
George W. Bush	1	0	1	1	1	0
Martin Van Buren	0	0	1	1	1	0
Andrew Johnson	0	0	1	1	1	0

## Is President James Monroe really in the Phonebook?

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0
James K. Polk	0	1	0	1	0	0
James A. Garfield	0	1	0	1	0	0
James Monroe	0	1	0	0	0	1
George W. Bush	1	0	1	1	1	0
Martin Van Buren	0	0	1	1	1	0
Andrew Johnson	0	0	1	1	1	0

## What is George Bush Selling?

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0
James K. Polk	0	1	0	1	0	0
James A. Garfield	0	1	0	1	0	0
James Monroe	0	1	0	0	0	1
George W. Bush	1	0	1	1	1	0
Martin Van Buren	0	0	1	1	1	0
Andrew Johnson	0	0	1	1	1	0

## How is Martin van Buren Making News?

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0
James K. Polk	0	1	0	1	0	0
James A. Garfield	0	1	0	1	0	0
James Monroe	0	1	0	0	0	1
George W. Bush	1	0	1	1	1	0
Martin Van Buren	0	0	1	1	1	0
Andrew Johnson	0	0	1	1	1	0

### [Martin Van Buren retires at 81](#)

The **Martin Van Buren** School building on Route 9 in Kinderhook Village was dedicated in 1930 by then-Gov. Franklin Delano Roosevelt. On Monday, students past and present gathered on the front lawn of the school to share stories, get nostalgic and say ...

Register-Star · 6/21/2011

## How is Andrew Johnson Making Videos?

	Commerce	Image	Entity card	Video	News	Phonebook
Thomas Jefferson	0	1	0	1	1	0
James K. Polk	0	1	0	1	0	0
James A. Garfield	0	1	0	1	0	0
James Monroe	0	1	0	0	0	1
George W. Bush	1	0	1	1	1	0
Martin Van Buren	0	0	1	1	1	0
Andrew Johnson	0	0	1	1	1	0

### Videos of **andrew johnson**

Discover videos of **andrew johnson** with Bing Video Search



All this has been very useful to us but ...

We don't have standard ways to

- Provide scrillions of inputs
- Execute scrillions of tests against the software
- Judge the scrillions of results

All this has been very useful to us but ...

We find it hard to

- Talk about a “test case”
- Talk about “pass/fail”
- Talk about “test tools” and “harnesses”
- Talk about “done”

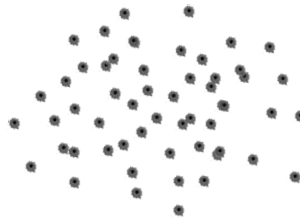
All this has been very useful to us but ...

We don't have a clear plan for

- Educating our testers
- Supporting our testers
- Evaluating our testers
- Solidifying our gains

## Useful Resources

- **The Oracle Assumption of Program Testing** (Weyuker, 1980)
- **Pseudo-Oracles for Non-testable Programs** (Weyuker & Davis, 1981)
- **On Testing Non-Testable Programs** (Weyuker, 1982)
- **Massive Stochastic Testing of SQL** (Slutz, 1998)
- **Heuristic Test Oracles** (Hoffman, 1999)
- **High Volume Test Automation** (Kaner, Bond, McGee, 2003)
- **Using Oracles in Testing and Test Automation** (Hoffman, 2006)



*Thanks!*