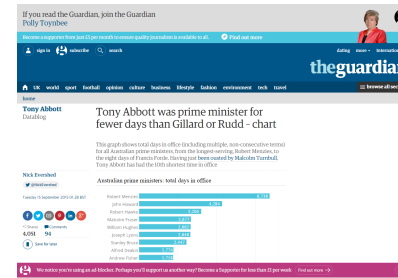


Suggested Interactivity: Seeking Perceived Affordances for Information Visualization

Jeremy Boy, Louis Eveillard, Francoise Detienne, and Jean-Daniel Fekete
IEEE Transactions on Visualization and Computer Graphics, Vol. 22, No. 1, January 2016

Presented by: Kimberly Dextras-Romagnino

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How can we attract these users' attention to a visualization and suggest its interactivity through design?

Background

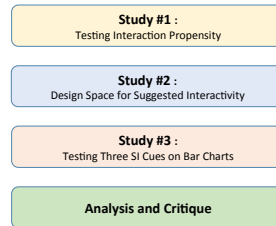
Affordances

- Real affordances:** the actual physical properties of an artifact that call for action
- Perceived affordances:** the perception and/or understanding a person has of the actions that can be performed with that artifact

Feedforward: tells users what the result of their action will be

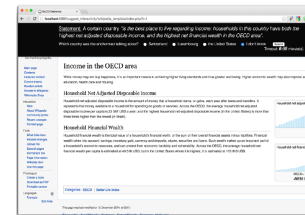


Breakdown



Setup

- 7 simulated articles with text and visualizations
- Layout:** Wikipedia
- Data and Text:** OECD Better Life Index website
- Task:** simple fact-checking task
 - Multiple choice extraction task
 - Possible to do task with text and with visualization



Setup

- Participants from Amazon Mechanical Turk
 - Native English speakers

Coding

- Brush interactions
- Decisive brushes
- Number of subsequent trials decisive brushes were used
- Participant's answers

Analysis

- Point estimates and 95% CI based on 10 000 percentile bootstrap replicates

Experiment #1:

Are people inclined to interact with charts to carry out fact-checking tasks?

- H1.1:** A majority of participants will not know that the charts are interactive, and therefore they will not use them to complete trials
- H1.2:** a majority of participants who 'discover' the interactivity of the charts will use them throughout all subsequent trials

Experiment #1: Important Results

- Only used participants with score > 0
 - 59 participants
- H1.1 & H1.2 confirmed**
- Layout contribution
- Charts perceived as efficient

Measure	Percent
> 1 Brush	42.4
>1 Decisive	28.8
(Decisive Brush)	68%
(Brush in all 7 trials >1 Brush)	52%
(Brush in subsequent trials Brush)	60%
(Decisive in all 7 trials >1 Decisive)	58.8
(Decisive in subsequent trials Decisive)	88.2

Experiment #2:

Are charts more efficient than text?

Trials 3,4,5 were replaced with just charts

- H2.1:** all participants will interact with the charts in trials [3-5]
- H2.2:** majority of participants will use the charts in trials [6-7]
- H2.3:** there will be good evidence that more participants interact with the charts in trials [6,7] than in [1,2]
- H2.4:** participants should complete trials [6,7] faster than [1,2]

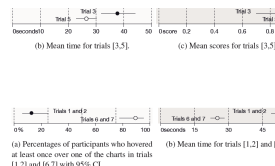
Experiment #2: Important Results

- H2.1 failed:** not all participants interacted with charts
 - Visualization literacy

Needed to get used to charts

- H2.2, H2.3, H2.4 confirmed**

Charts are more efficient
 Conclusion: charts are more efficient



Experiment #3 + Results:

Is Wikipedia layout choice biasing results?

Ran experiment #1 again without Wikipedia styling attributes

H3: results will be consistent with **Experiment #1**, meaning Wikipedia styling did not bias participants' behaviour

Results: consistent with Experiment #1

Study #1: Conclusions

- Lack initial propensity to interact with charts embedded with text
- Visualization literacy problems
- Charts are more efficient
- People can be motivated to interact with visualizations if they are shown the possibility
- Highlights the need for suggested interactivity

Study #2 :
 Design Space for Suggested Interactivity

Definitions

Suggested Interactivity (SI) : set of methods for indicating that a graphical area can be interacted with by subtly directing a user's attention so as not to impede too heavily on this person's focus or on the rest of the interface design

SI cues : specific graphical elements or attributes that are used for suggesting interactivity

Design Space for Suggested Interactivity

Attractor: the object that attracts attention to the interactive area

- Object of interest
- External object

Animation: the state of the attractor over time

- Staged: blink
- Interpolation: unique or looped
- dynamic

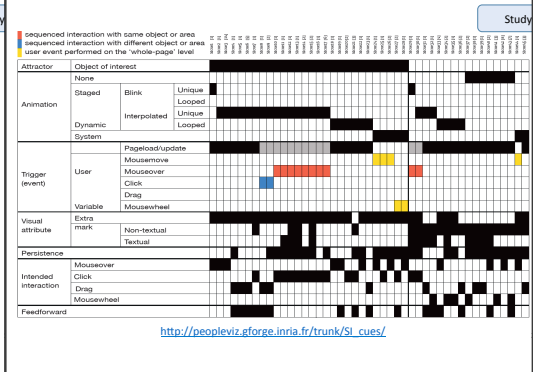
Trigger: the event that initiates the animation

- System event
- User event

Visual attributes: the specific visual variables and/or marks the animation is applied to

Persistence: the ongoing display or not of the cue once the interaction has been performed

<http://www.cs.ubc.ca/~tmm/courses/547-15/>



Study #2: Results and Observations

SI cues are mostly applied to object of interest

Animation is determined by what triggers it

- Staged animation -> system events
- Dynamic animation -> user-events

Combinations: interest attractor and external object attractor

- Feedforward

Dimensions useful for analyzing current visualizations but too complex when it comes to creating new ones

Design Considerations

Visualisations as attractors

- Already depend on visual marks
- Should not play with free visual attributes
- Required animation:
 - staged : organic motion: heart beat
 - dynamic: attractive motion: orienting, squeezing, stretching depending on how far mouse is

Icons as attractors

- Focal icon
- Identifier icon
- Demonstrator icon

Study #3 :
Testing Three SI Cues on Bar Charts

Suggested Interactivity #1

Attractor: visualization

Animation: staged, looped

- organic motion- heartbeat

Trigger: page-load

Persistent: no

Suggested Interactivity #2

Attractor: focal icon

Animation: no

Trigger: page-load

Persistent: yes

- Visible when out of focus

Suggested Interactivity #3

Attractor: visualization and demonstrator icon

Animation: looped staged

Visual mark: text label

Trigger: page-load

Persistent: no

Follow up study results

Conducted follow-up study on AMT

Reproduced **Experiment #1** three times applying each SI between subjects design

H4: more participants will perform brush interactions and decisive brushes when an SI cue is applied to the charts

Results: H4 failed

- No evidence that SI1 or SI2 had any effect
- SI3 had an effect

Analysis: What, Why, How

What	Any Visualization embedded in text	
Why	Suggested Interactivity	
How	SI1	Motion
	SI2	Overlay Focal icon
	SI3	Motion + external icon

Critique

- Small scope
 - Only visualizations embedded in text
 - Only considered 3 SI options
 - Specific task
- Only focused on hovering on bar charts
- Didn't consider age or experience of users
- Only a transition phase

Overall Conclusion

- Lack initial propensity to interact with charts
- Low interaction literacy
- Suggested Interactivity is necessary
- Subtle cues are not effective
- Feedforward is crucial

Questions?