Experiences with an Eye Tracker in Visualization Studies

A Study and Some Lessons

Ji Soo Yi
Assistant Professor
School of Industrial Engineering, Purdue University

2/18/2014 @ DLRC Symposium

Eye Tracker - Magic Wand?

“We are excited to have an eye tracker, so we can figure out what people think.”

“We are interested in which information that people rely on while doing XX, so now we can do it with this expensive eye tracker.”

We Thought So...

Example: SimulSort Study

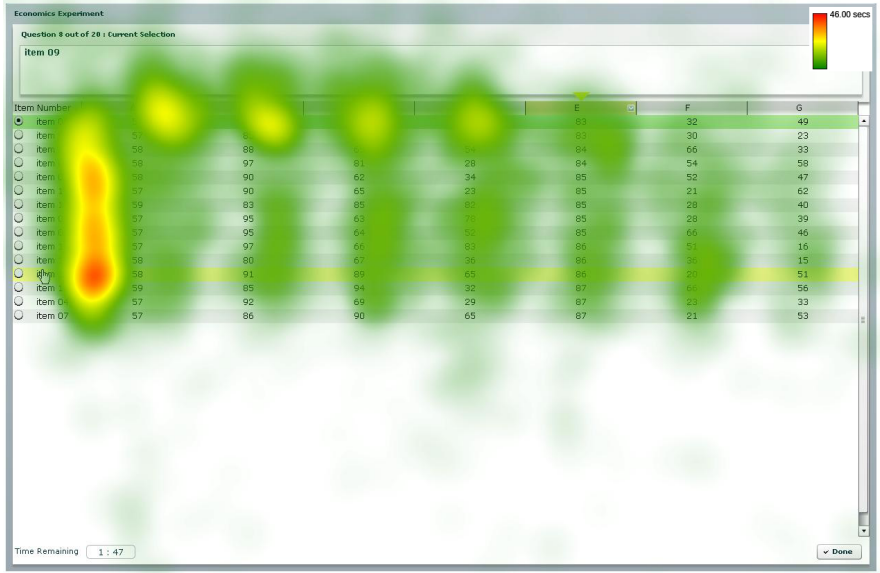
Item Number	A	B	C
item 11	78	43	37
item 13	85	43	38
item 05	87	76	38
item 14	83	52	44
item 10	85	73	48
item 15	86	68	48
item 12	86	61	51
item 09	78	72	51
item 01	78	73	63
item 07	88	64	64
item 08	84	69	64
item 03	80	41	67
item 06	85	73	68
item 02	79	46	70
item 04	84	65	73

Typical Sorting

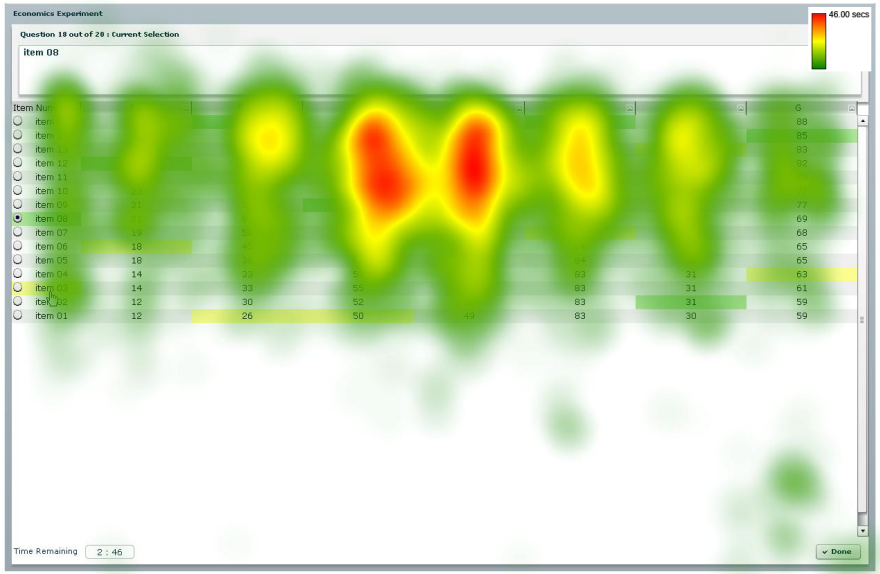
Item Number	A	B	C
item 15	88	76	73
item 14	87	73	70
item 13	86	73	68
item 12	86	73	67
item 11	85	72	64
item 10	85	69	64
item 09	85	68	63
item 08	84	65	51
item 07	84	64	51
item 06	83	61	48
item 05	80	52	48
item 04	79	46	44
item 03	78	43	38
item 02	78	43	38
item 01	78	41	37

SimulSort

Example: SimulSort Study



Typical Sorting



SimulSort

Example: SimulSort Study

Item	Attr 1	Attr 2	Attr 3	Attr 4	Attr 5	Attr 6
1	35	83	16	47	33	20
2	67	91	79	47	17	18
3	61	80	92	43	33	12
4	39	85	12	45	35	24
5	56	90	36	42	30	24
6	54	80	48	46	24	21
7	54	81	17	41	14	16
8	46	88	16	46	34	24
9	64	85	30	42	14	15
10	58	80	16	44	14	22
11	35	90	74	42	15	22
12	65	87	71	47	17	23
13	38	85	79	47	33	16
14	45	84	89	41	32	22
15	64	80	32	47	31	21

(a)

Attr
80
35
34
33
32
30
29
28
26
25
24
22
21
20
19

(b)

Influential Column

Position A

no	★	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

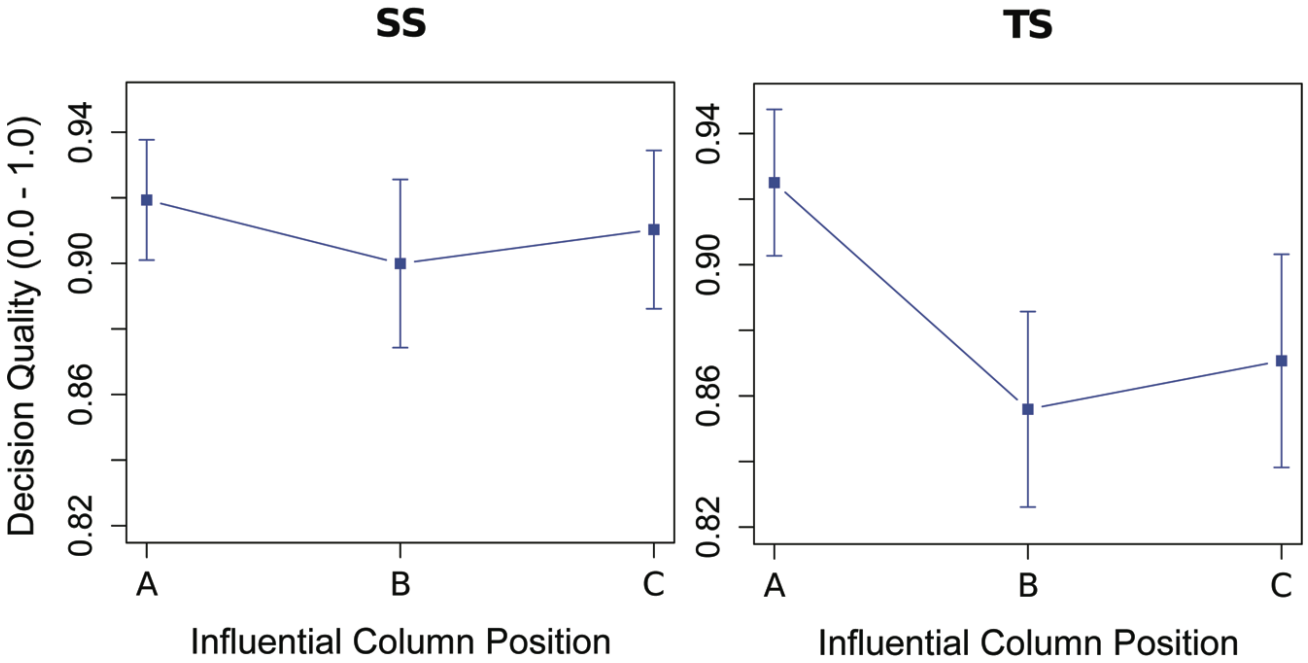
Position B

no	1	2	3	★	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Position C

no	1	2	3	4	5	6	★
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Example: SimulSort Study



Lessons

- “An Eyeball Tracker.”
  - It only works well when the Eye-Mind Hypothesis is made.

Lessons (cont’d)

- Know what you want, and decide carefully.

Types of Eye Trackers

- Mobile
- Monitor-Embedded
- Separate-Unit
- High Resolution
  - Usually w/ a Chin Rest

Types of Eye Trackers

- Mobile
- Monitor-Embedded
- Separate-Unit
- High Resolution
  - Usually w/ a Chin Rest

Types of Eye Trackers

- Mobile
- Monitor-Embedded
- Separate-Unit
- High Resolution
  - Usually w/ a Chin Rest

Types of Eye Trackers

- Mobile
- Monitor-Embedded
- Separate-Unit
- High Resolution
  - Usually w/ a Chin Rest

Lessons (cont'd)

- Requires some hands-on experiences.
- Easy access is quite important.
  - One should be able to play with an eye-tracker.
  - Yes, an eye tracker is expensive, but an unused eye tracker is more expensive.

Lessons (cont'd)

Data collection is easy, but data analysis is difficult.

- Area-of-interest-based (AOI-based) analysis is most common.
- When scenes are dynamic, AOI-based analysis requires manual coding.

Lessons (cont'd)

- Accuracy: 0.5 - 1 degree:
  - A thumbnail size with an stretched arm
- Participants in an eye-tracking study get tired easily.
  - Breaks every 10 minutes are recommended.

Rule of Thumbs

Use it

- When a specific task is given.
- E-M Hypothesis is made.

Dont’ use it (or use it in an exploratory manner)

- Tasks are not specific.
- Dynamic Screen

Summary

- An eye tracker is a fascinating tool to measure a physiological (not psychological) phenomenon.

Summary

- An eye tracker is a fascinating tool to measure a physiological (not psychological) phenomenon.
- A researcher’s role is to connect the physiological phenomenon to a psychological phenomenon.