**COMP 1710 RESEARCH REPORT**
Lydia Huang
word count: 2097

**Abstract:**
Two Human-Computer Interaction (HCI) research experiments of type A and type B are compared and analysed, to understand the relevance and connection between user-participation experiments and web design and development. Through the personal experience of both experiments, a connection between the experience and usability criteria can be made. The usability criteria detail how to create an easy HCI.

**Introduction:**
The following report details the experiences and thoughts between two Human-Computer Interaction research experiments of type A and type B. Type A experiments involve the participation of tasks to provide data that can be compared to other participants and Type B includes explicitly comparing two or more visual images or videos. Experiments *Visual Search and Cognitive Failures* and *Sparse Historic Photo* are the two type A and type B experiments that will be compared. Each experiment will be summarised, described, and commented on, and then compared on the criteria of how the experiment was run, content, research, and opinion on the participation of the experiment. The information gathered from the comparison is used to assess what creates a good HCI based on the user usability criteria.

**Experiment One: *Visual Search and Cognitive Failures***
The first experiment *Visual Search and Cognitive Failures* was an online study focusing on cognitive psychology. Cognitive psychology involves the scientific study of brain function and how it processes knowledge and information.[1] Multiple items were overlayed on top of each other at various opacities to create a distractor. Participants are then required to search through the overlayed images to determine whether a gun was present. If the gun was present, you pressed a certain key, and the same if a gun was not present. This was the first part of the experiment that was then followed up by a questionnaire on personal cognitive behaviour. The questionnaire featured questions on whether we misplace things often if we often cannot find items right in front of us, and how we perceive our environment. The experiment aimed to research the causes and consequences of attentional re-sizing flexibility.[2] This idea was explored through the participants' responses in the visual search as the gun got scaled up and down.

Part taking in the experiment required mechanical and intelligent tasks. Task one was a mechanical task as it required searching for the target and then pressing a key depending on whether the target was there or not. Task two was on intelligence as the questionnaire consisted of questions on our cognitive behaviour. I enjoyed this experiment as I found the visual search very enjoyable. Although I found it enjoyable, it was quite tedious at the end as there were many images, so I was glad that the experimenter had included short breaks. The visual search itself was a quite simple concept and I did not find it too difficult. Still, I found myself pressing the wrong key or suddenly spotting the target as I pressed the key. I believe this could be due to me getting lazy or losing attention towards the end as the images got repetitive. The given instructions were very clear, and an admissible test was given at the start to familiarize me with the key functions.

[1] Mcleod, 2020, Cognitive Psychology
[2] Goodhew, S., 2021. *Participation Info Sheet: The Causes and Consequences of Attentional Re-Sizing Flexibility*

The strengths of the experiment were the simplicity and familiarity of it, as visual searches are something we do in everyday life it is easy to understand what the task at hand is. Weaknesses include the length of the experiment and the repetition of it. Although I doubt this could be improved as a set amount of data is needed to create enough information and there must be controlled variables. Perhaps if the experiment was completed in person or if it was broken up into more parts that featured various visual search tasks. I believe due to how easy it was to understand that the data would be reliable, and the aim would be met.

**Experiment Two: *Sparse Historic Photo***

Experiment two *Sparse Historic Photo* is a type B online study that required the recording of a webcam and microphone. The experiment was made of 4 parts, an image comparison, two image analyses, and a final questionnaire. Image comparison consisted of a selection of Australian military men that contained a pair of the same person. The second and third parts required an analysis of the images, deciding on the pitch, yaw, and roll of the head positioning (refer to image 1) in the photos, and estimating an exact angle of the roll. The final questionnaire included questions of the origin and class of the given images. The experiment aimed to show the difference between AI and human perception. AIs can match images of people but not sparse photos. Therefore, with the research on human perception, we might be able to program AI's to be able to match sparse photographs.[3] Although using human perception incorporates ideas of cognition as participants take in the imagery and process it to distinguish the pair.

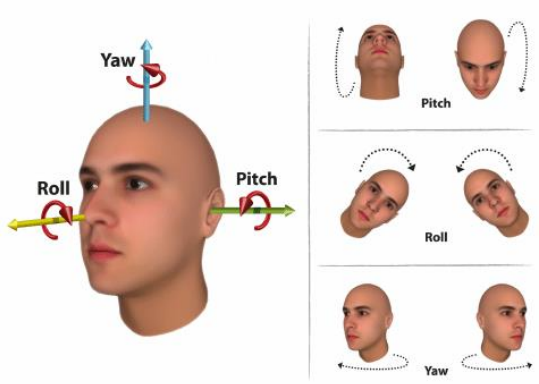


**Image 1**: Orientation of the head in terms of pitch, roll, and yaw movements describing the three degrees of freedom of a human head

The tasks involved in task two consisted of mechanical and intelligent tasks. Similarly, experiment one required mechanical tasks and ended with an intelligent task. I did not find the experiment as enjoyable, but it was quite interesting. I found it quite confusing and did not understand what to do. Yet, it was still interesting, participating in the various tasks and learning about how the positioning of the head can affect our perception of people. I found experiment two to be quite difficult because I struggled with matching up the images and perceiving the pitch, yaw, and roll of the head positions. Although because the experiment is testing how we perceive things it does not matter if it is right or not. The given instructions were a bit ambiguous, and I found it hard to understand what they were asking; this is further covered in the next section. Strengths of experiment two consist of having various parts so it was interesting to complete. The tasks were all connected but required you to examine the images in different aspects. However, the experiment fell short with the instructions of the tasks. I found task 3 with the hand movements very hard to understand and most likely completed the task wrong. Even though diagrams were provided I did not quite understand what they were asking.

[3] Caldwell, S., Human Centred Computing team., 2021. *Participation Info Sheet: Sparse Historic Photos*

Some of the questions in the questionnaire I also did not understand especially when asking for the class and image properties. It was unclear what they meant specifically. Perhaps if a definition was provided or more examples it would be clearer. Another weakness would be the submission of the recording as it asked to attach the file but there were no file drop boxes. So, I was extremely confused about how the video submission worked as it asked for a link. I'm not sure if this was an error but the picture matching was meant to be done within 20 seconds, but the pictures did not change until you answered the question. So, participants could take as long as they wanted. The experiment was conducted online so it was not chaotic however I can see how the recording of the webcam could cause problems. I would imagine that some of the data would not be reliable or useful because I could not understand the instructions and what was asked of. Therefore, other participants might have had similar experiences and the data would be dismissed. Due to this, the aim of the experiment may not have been met.

**Comparison of Experiment One and Experiment Two**

Physically both experiments contain the use of images and questionnaires. Experiment one using images to create a visual search and Experiment two using imagery to create a visual search of a different variety. However, Experiment two can still be classified as a visual search as the target is the images that contain the same person. Both experiments use visual experiments to explore cognitive behaviour. Although the first experiment only uses images to create a visual search experiment two dives further into the idea of image perception and brain cognition. Experiment one focuses more on humans and the improvement attentional re-sizing flexibility of humans. Whilst experiment two looks more at AI improvements and how we can create better AI's. I enjoyed part taking in experiment 1 more than experiment 2. Experiment 1 was easy to understand whilst experiment 2 was confusing. Both experiments were run similarly with online tests. However, due to the instructions given and what was required (e.g., experiment 2 requiring camera and mic recordings), I would say experiment 1 ran better than experiment 2. Experiment 1 had a better HCI than experiment 2 when compared due to its simplicity.

**Relevance of the Experiments to Web Design and Development**

The analysis and participation of both experiments allow the exploration of user-experience in Human-Computer Interaction (HCI.) HCI can be sorted into the criteria of the usability evaluation which consists of *Intuitive design*, *Ease of learning*, *Efficiency of use*, *Error frequency and severity*, *Memorability* and *Subjective satisfaction*.[4]

Through my own experience with both experiments, I can understand what makes a good HCI experience for users. Intuitive design means easy and understandable navigation for the site.[5] From the comparison between the two experiments, experiment one was easy and understandable however experiment two was hard to understand. Experiment two had unclear and unfamiliar instructions. Therefore, to have a good intuitive design the navigation should be somewhere familiar, for example, the navigation bar at the top of the page.

Like the intuitive design, ease of learning is the straightforwardness of the site and whether new users can easily understand how to use the site.[6] The design of the website layout should be somewhat similar and not overly complicated. Experienced users should also be able to easily use the site.[7] In experiments 1 and 2 as I completed more tasks,

[4] Usability.gov. 2021. *Usability Evaluation Basics | Usability.gov*.
[5] IBID
[6] IBID
[7] IBID

it became easier, and I was able to complete them faster. Learning from this, sites should have simple tasks as having over complicated tasks will affect the efficiency of use.

The site should also be tested to make sure there are limited errors or small errors that can be easily solved. Experiment one had no errors while experiment two did have a few errors that did not affect the test. To limit errors the site should be tested by the developer themselves or by friends.

The site should be memorable and satisfactory.[8] The two experiments were memorable as they were both unique and I had never seen them before. Experiment one was enjoyable, so it was even more memorable. Although experiment two was not enjoyable I still remember it because of how unenjoyable it was. I had many issues with experiment two, so I spent more time on it making it even more memorable.

Furthermore, the two experiments both research cognitive behaviour and/or perception and can provide an insight into the model of information processing. With knowledge of how humans sort through information, we can program AI's to be able to do the same and follow a similar process. Although this does not only apply to AI's this can be used for web designers. The information can help with designing websites with intended impacts, themes, and messages. Experiment two focuses on the image perception of humans, designers can use the findings to alter how they want their site perceived. For example, a study was done on pitch, yaw, and roll found that perception was deceived greater when participants were lying down vs sitting upright.[9] Therefore, specified research on cognitive behaviour can allow developers to understand how certain images, colours, sounds, etc can change the way their site is perceived.

Due to participation in both experiments, comparison and conclusion can be made on what works in HCI. With this information, web designers can create sites that fit the usability evaluation and have HCI very easily and enjoyable for site users.

[8] Usability.gov. 2021. *Usability Evaluation Basics | Usability.gov*.

[9] Vidal, M., Amorim, M., Mcintyre, J. and Berthoz, A., 2006. *The perception of visually presented yaw and pitch turns: Assessing the contribution of motion, static, and cognitive cues*.

**References**


Caldwell, S., Human Centred Computing team., 2021. *Participation Info Sheet: Sparse Historic Photos* [PDF file]

Cavalcanti, G., Arcoverde, E., Duarte, R. and Barreto, R., 2014. *Orientation of the head in terms of pitch , roll , and yaw movements describing the three degrees of freedom of a human head.* [image] Available at: *https://www.researchgate.net/profile/Tsang-Ing-Ren/publication/279291928/figure/fig1/AS:292533185462272@1446756754388/Orientation-of-the-head-in-terms-of-pitch-roll-and-yaw-movements-describing-the-three.png*

*Comp1710 Assignment + Report: Semester 1 2021* [PDF file]

Goodhew, S., 2021. *Participation Info Sheet: The Causes and Consequences of Attentional Re-Sizing Flexibility* [PDF file]

Mcleod, S., 2020. *Cognitive Approach* | *Simply Psychology*. [online] Simplypsychology.org. Available at: https://www.simplypsychology.org/cognitive.html

Usability.gov. 2021. *Usability Evaluation Basics* | *Usability.gov*. [online] Available at: https://tinyurl.com/wtkz6zk

Vidal, M., Amorim, M., Mcintyre, J. and Berthoz, A., 2006. *The perception of visually presented yaw and pitch turns: Assessing the contribution of motion, static, and cognitive cues*. [online] Link.springer.com. Available at: https://link.springer.com/content/pdf/10.3758/BF03193732.pdf