Improving VR User Experience using Non-Invasive BCI

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Introduction

The demand for Virtual Reality (VR) has been growing for the last five years. The market demand for the VR system has grown steadily, with a lot of research and development process being done not only in video games, but also in other areas such as news, film industries, medical simulations, healthcare and clinical therapy.

With the growing interest directed towards the virtual reality technology, it is crucial to keep on improving the current system that already exist and improve the interactivity and the immersion of the virtual space.
Starting at 2016, VR technology has been widely commercialized and has seen significant growth and it is predicted to be continuously growing.

- Japan is pioneering the VR technology and companies invested million dollars for VR research
  - New VR center in Tokyo
  - Dedicated VR theme park
  - IMAX VR Center in Tokyo
  - Japan Universal Studios Final Fantasy VR

https://www.engadget.com/2017/07/18/vr-zone-shinjuku-project-i-can-tour/

Background

- Users do not feel comfortable with the device
- Developers are still trying to figure out the issues during development process.
- During user testing process, participants missed a lot of important points
- During VR interactions there are a lot of Quantitative and Qualitative data
  - Surveys which measures user perceptions
  - Other physiological movements

- Source:
  - Tussyadiah I., Wang D., Jia C.
  - Negishi Y., Mitsukura Y., Fukai H, Tomita H.
Justification

- VR technology has great potential
  - Requires more research
  - Understand the user needs

http://www.technologiesblog.eu/the-unbelievable-potential-of-vr-isnt-video-games-or-pictures-its-medication/
Goal

- Using EEG sensors to obtain user’s brain signal activity and use the data to improve VR simulations
Case Study

- Several case studies were conducted to learn human’s psychological condition, i.e. emotions, interest, and comfortability using EEG sensors.

- A study to learn neural pattern recognition and create a system capable of identifying complex emotions using EEG. (Kanoga S., Mitsukura Y.)
  - The experiment has successfully achieved the goal of classifying the participants' complex emotions and multiple emotional states.
Case Study – cont.

- A study was conducted to find an association between comfortability and visual information when looking at streetscapes using EEG sensors and Questionnaires. (Yamaguchi S., Mitsukura Y.)
  - Some comfortabilities were detected only by using EEG
Challenges

- Non-invasive BCI is susceptible to noise
- Ethical issues – privacy
- Device can be overwhelming
- Cost issues
- Better integration with VR
Conclusion

- Certain relevant informations and datas are not obtainable through performing surveys and questionnaires alone
- With the growth of VR technology and the availability of consumer-level BCI devices it is advantageous to use the two technologies together
Reference


