Measuring the Annoyance in Streaming Media Caused by Buffers and Interrupts

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Introduction

- Streaming media is very important to today's culture
  - Online videos

- Annoyance with streaming media
  - Associated with the defects in the playback
  - Lacking research into the matter

Introduction – Buffers

- Buffers: Wait time at the beginning of the video

Introduction – Interrupts

- Interrupts: Pauses during the playback

Introduction – Motion

- The level of motion in a video is the amount of the image that changes over time

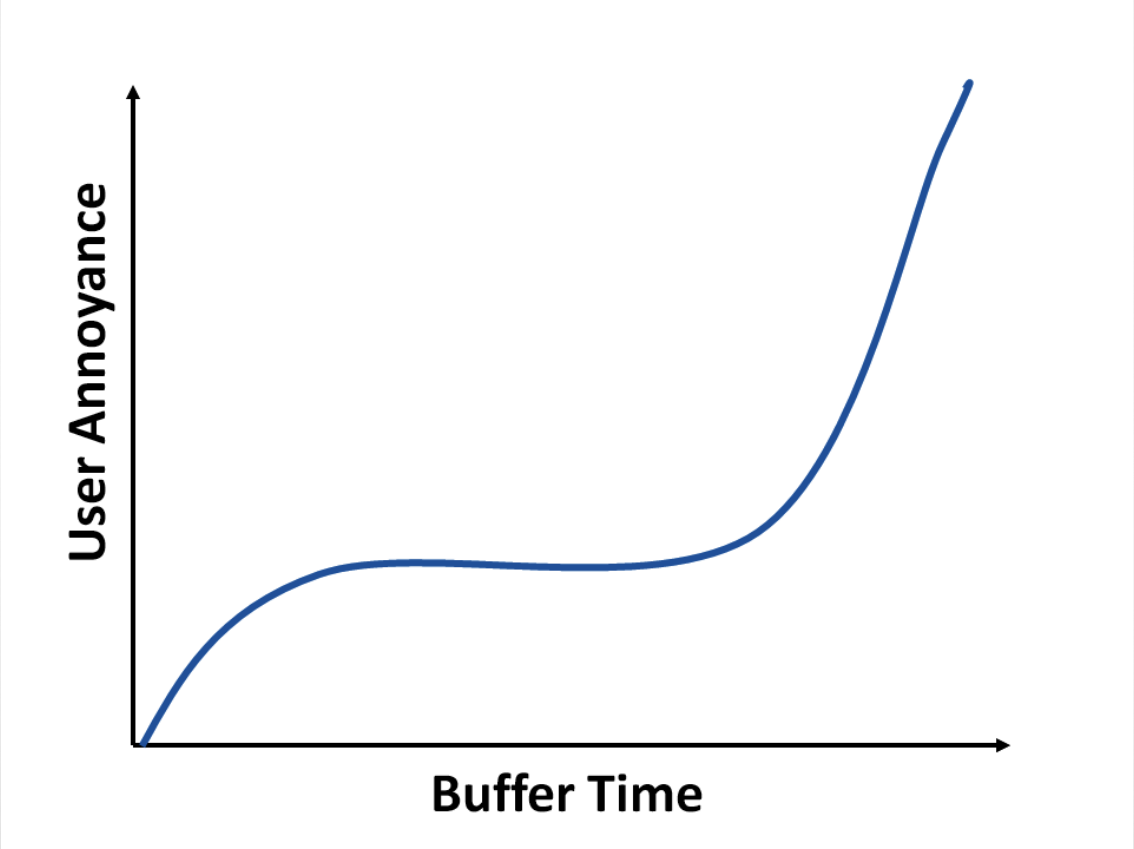
Outline

- Problem Statement
- Hypotheses
- Methodology
- Results and Analysis
- Conclusion

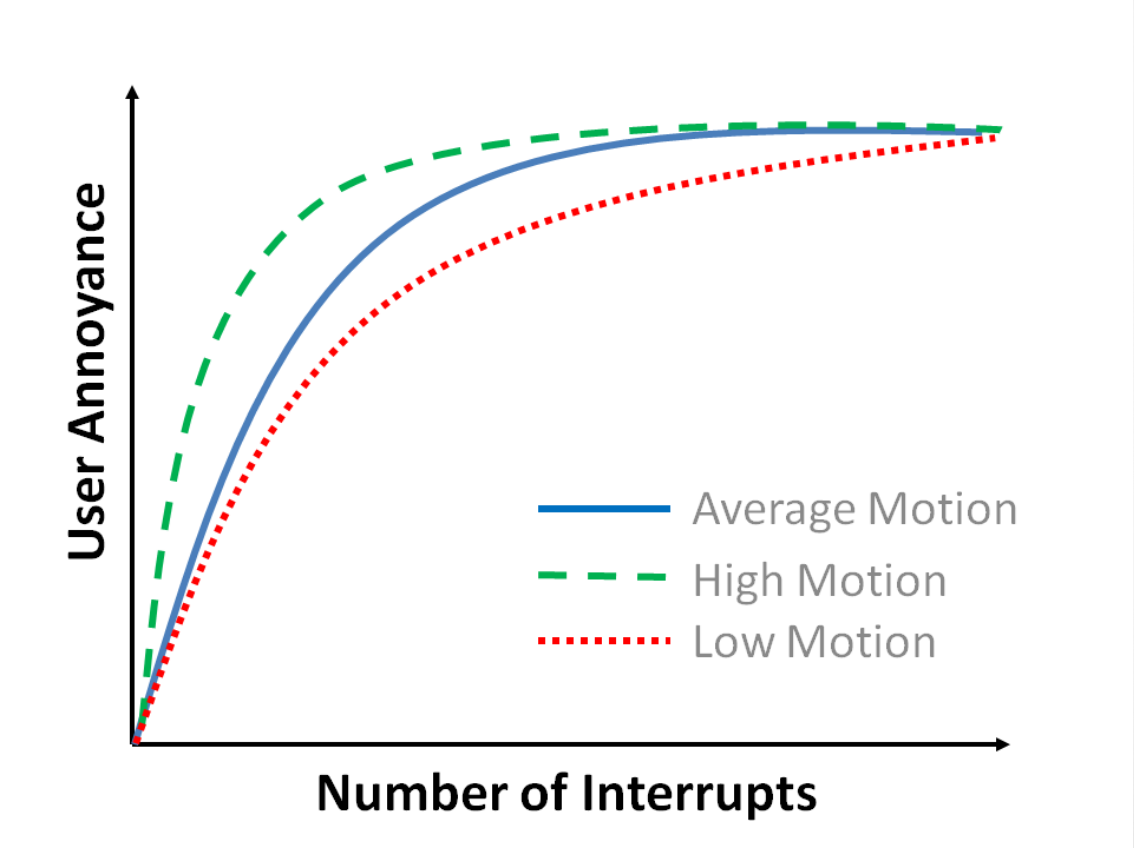
Problem Statement

- Assuming annoyance in streaming media is unavoidable, how do minimize it?
  - How do Buffers and Interrupts annoy the user?
  - Does the level of motion in the video have any affect on this annoyance?

Hypotheses



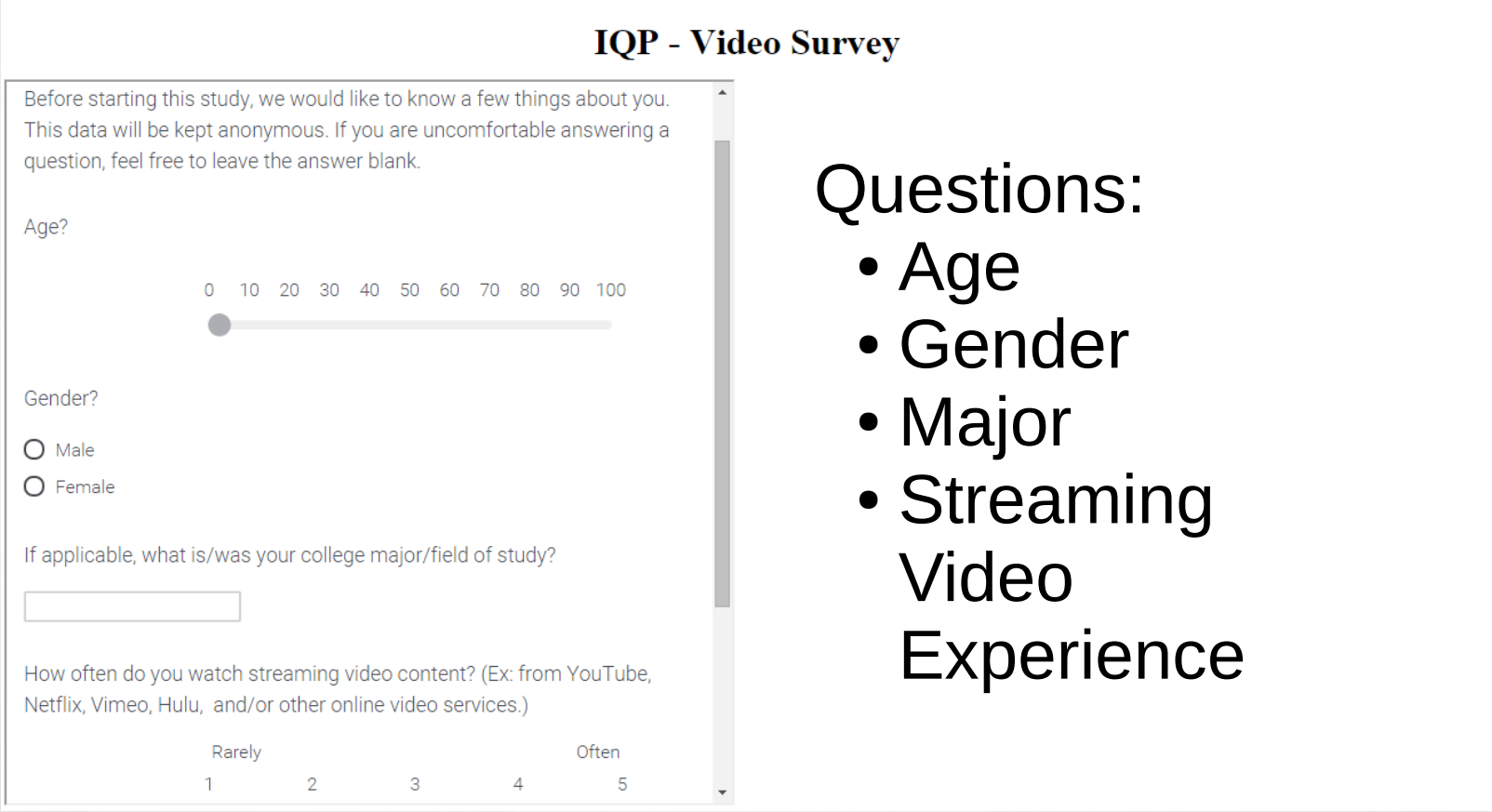
Hypotheses


User Annoyance
Number of Interrupts
Average Motion
High Motion
Low Motion

Methodology

- Prepared videos
  - Found videos to fill our motion categories
  - Inserted Buffers and Interrupts into videos
- Created survey to display videos to users and ask about their perceived annoyance
  - Demographic Questions
  - Video Questions

Methodology – Survey (Demographic Page)



Questions:

- Age
- Gender
- Major
- Streaming Video Experience

Methodology – Survey (Video Page)

IQP - Video Survey

Watch: Control

How annoyed were you by the quality of Control?

Less Annoyed — More Annoyed

1 2 3 4 5

Annoyance

How did you feel about the content of Control?

Disliked — Neutral — Liked

1 2 3 4 5

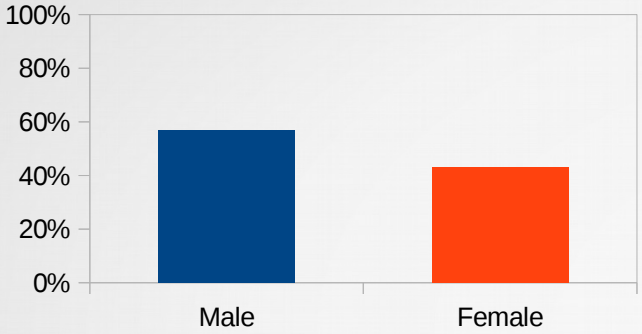
Powered by Qualtrics

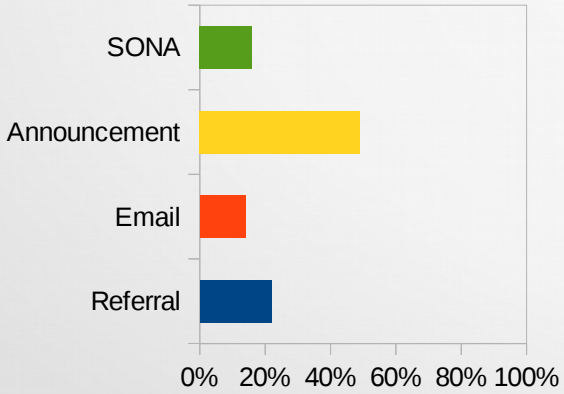
Control

Video 0/16

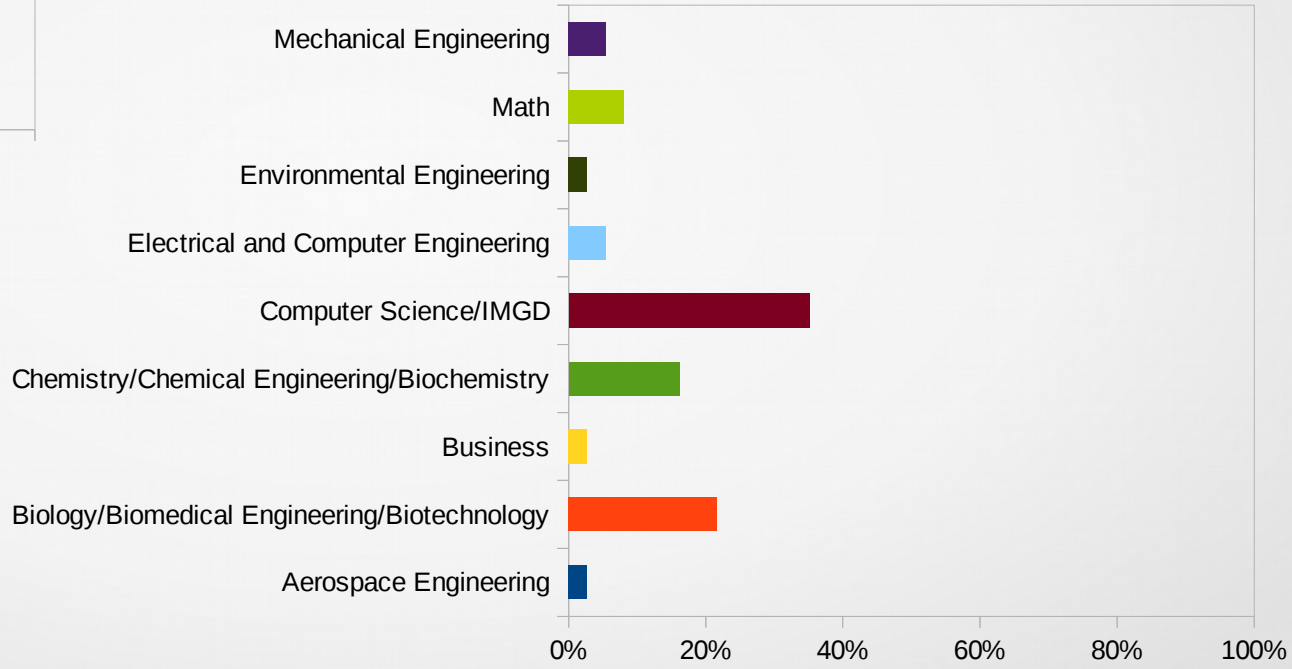
Play Video

Results – Demographics

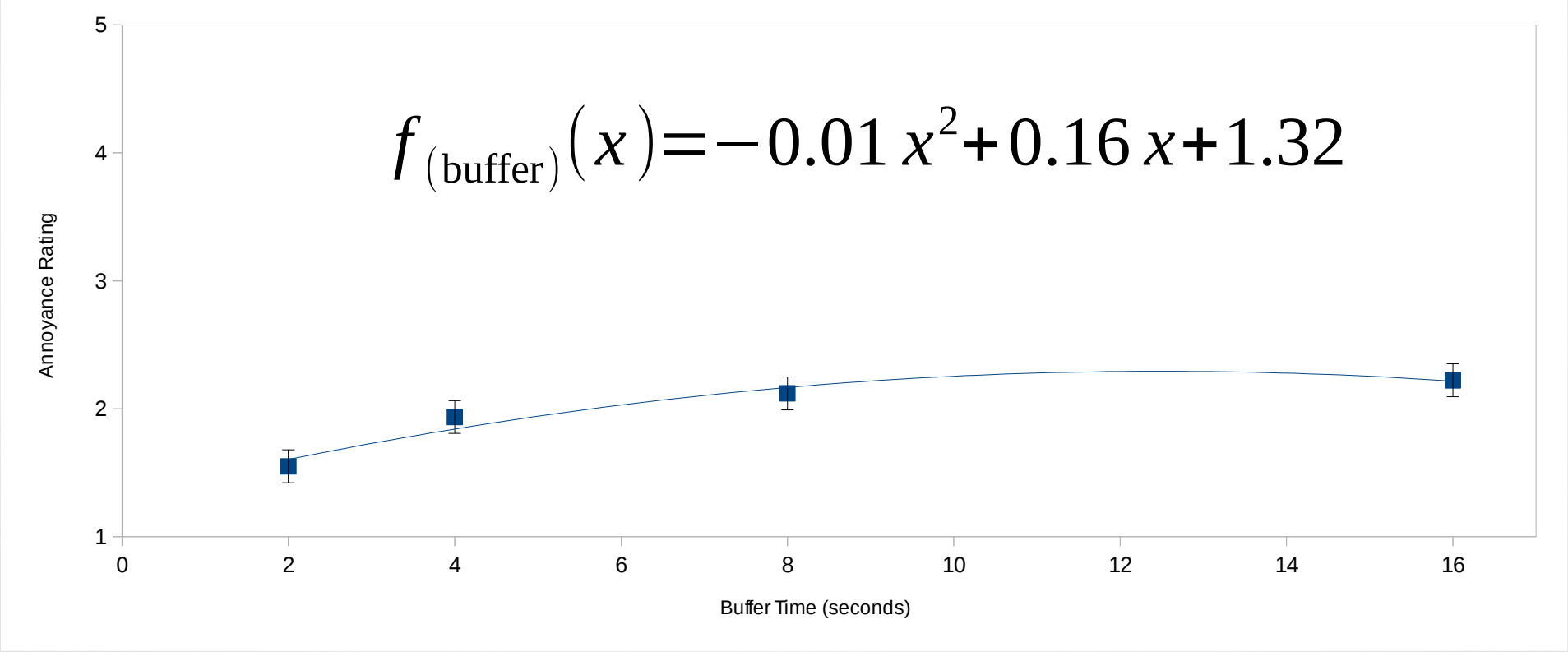




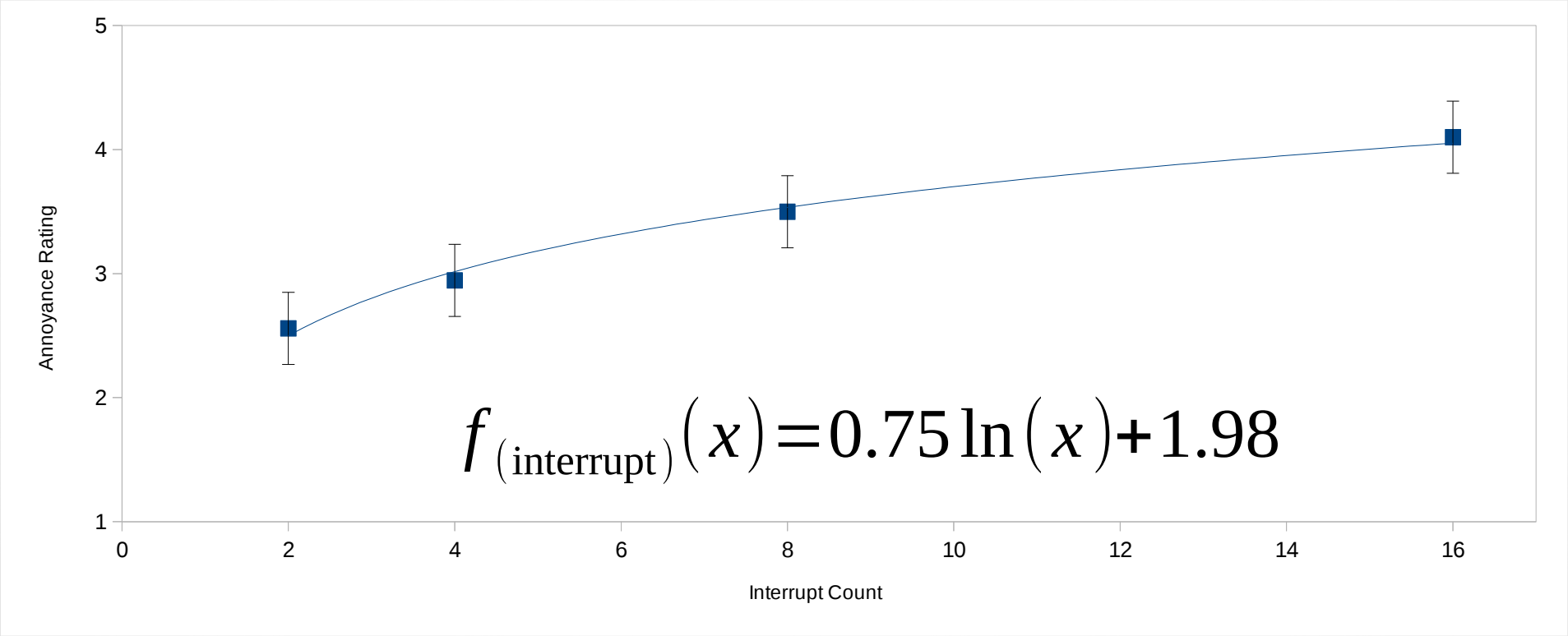
Total Participants: 37



Results – Buffers

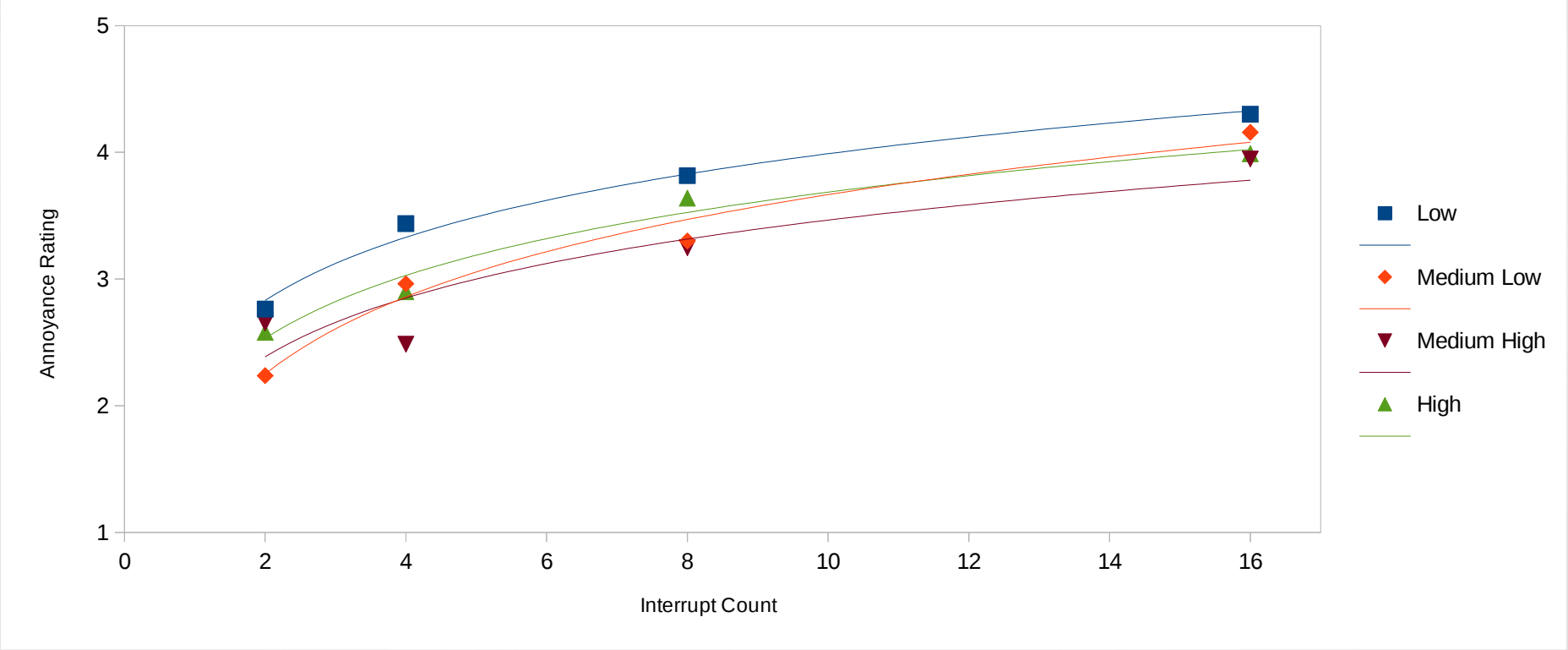


Results – Interrupts



Results – Interrupts and Motion

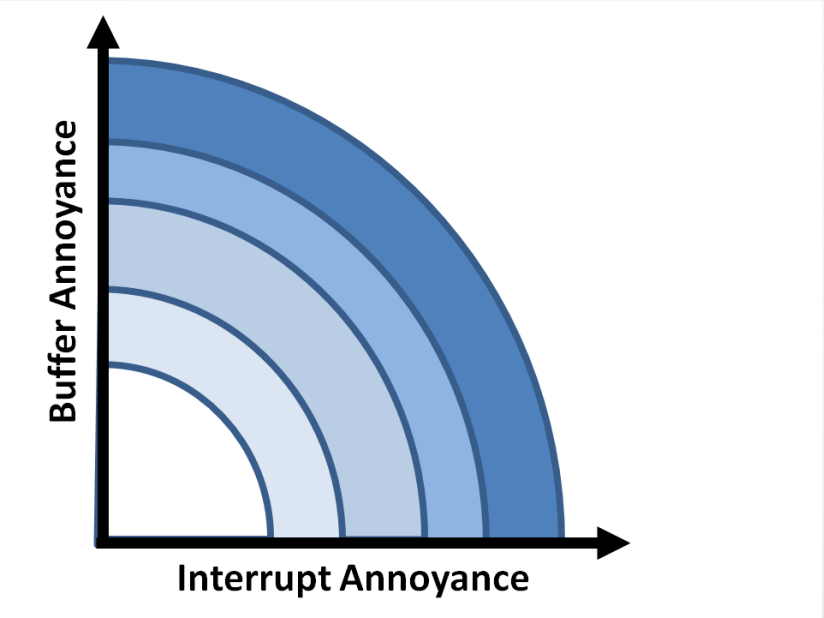
- Low Motion had the highest annoyance rating



Results – Theoretical Impact

$$f_{\text{estimated-total-annoyance}} = Min\left(f_{\text{buffer}}(x) + f_{\text{interrupt}}(y), 5\right)$$

$$f_{\text{min-annoyance}} = Max\left(f_{\text{buffer}}(x), f_{\text{interrupt}}(y)\right)$$



Conclusions

- Annoyance vs buffer time fits to a degree-2 polynomial
  - The value does not vary with motion level
- Annoyance vs interrupt count fits to a logarithmic function
  - The value is highest with the low motion category

Future Work

- Understand the combined annoyance relationship between buffers and interrupts

- Look for other factors that might affect a user's annoyance
  - Video Content
  - Sound

The End

Are there any questions?