Microsoft

Avatar: Enabling Immersive Collaboration via Live Mobile Video

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Background: Mobile Video Streaming Today

- High Bandwidth Mobile/Cellular data is rapidly becoming pervasive especially in developing countries like India.

- The number of smartphones have exponentially increased in the last few years

493.96
Million Mobile Internet Subscribers in India [1].

50%
Mobile internet traffic will consist of video streams by 2021 [2].

1. Telecom Regulatory Authority of India – The Indian Telecom Services Performance Indicator Report, January – March 2018.
2. Cisco – Visual Networking Index: Forecast and Methodology, 2016-2021.

Opportunities with the use of Live Video

- Enabling Task Oriented Experiences
  - Remote Shopping
  - Virtual Interactive Tourism
  - Audits and Verifications / Spot Checks
  - Remote Physical-World Games (Alternate Reality Games - ARGs)

Can live streamed task oriented experiences lead to new employment opportunities?

Traits of Collaborative Task Oriented Work

Participants collaborate in real time towards a goal and communicate in both directions to achieve the goal.
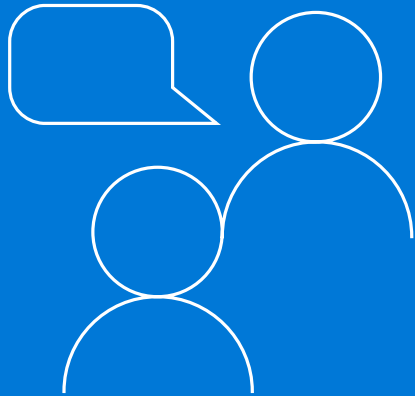
Participants on either side of the stream may not know each other.

Asymmetric power relationships between the creator and the consumer of the stream.

Opportunities & Challenges

1. Remote Shopping Experiences
2. Remote Gaming Experiences
3. Cooperative Work & Play Experiences
4. Spot Checking, Audits & Verification

1. Ethical Behaviour from Platform Users
2. Mitigation of illegal activities
3. Safeguarding the Privacy of streamers
4. Enabling productive employment

The Avatar Prototype – Components

1. Web Application Client for the viewers
2. Mobile application for the streamers
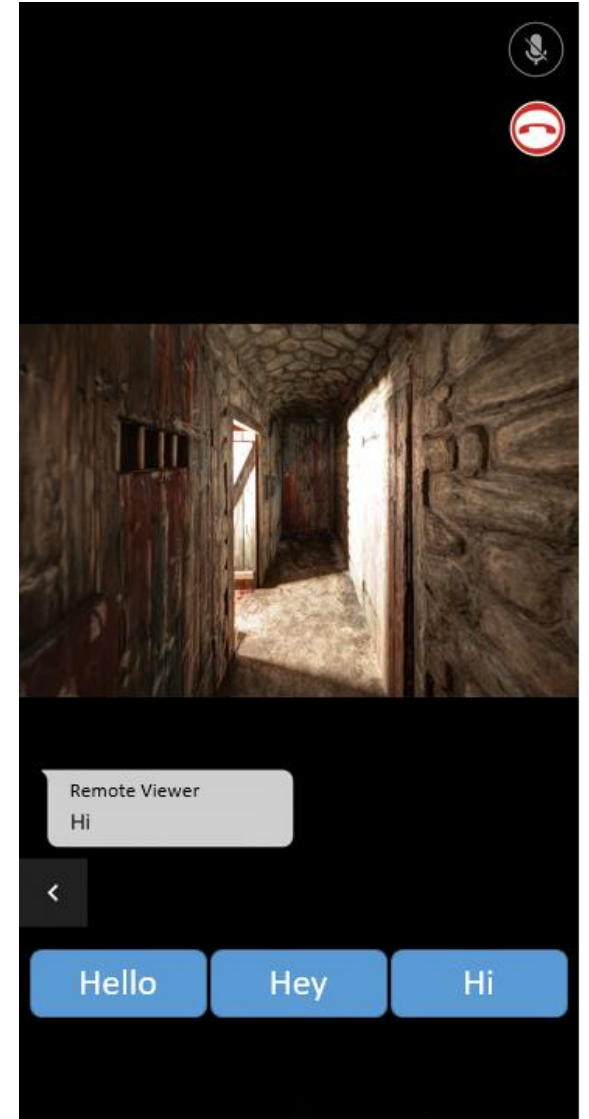3. Exploration of communication modalities

Web Application Client for the viewers

Viewers/Controllers use a web client to watch the video stream from the *Avatars/Streamers.*
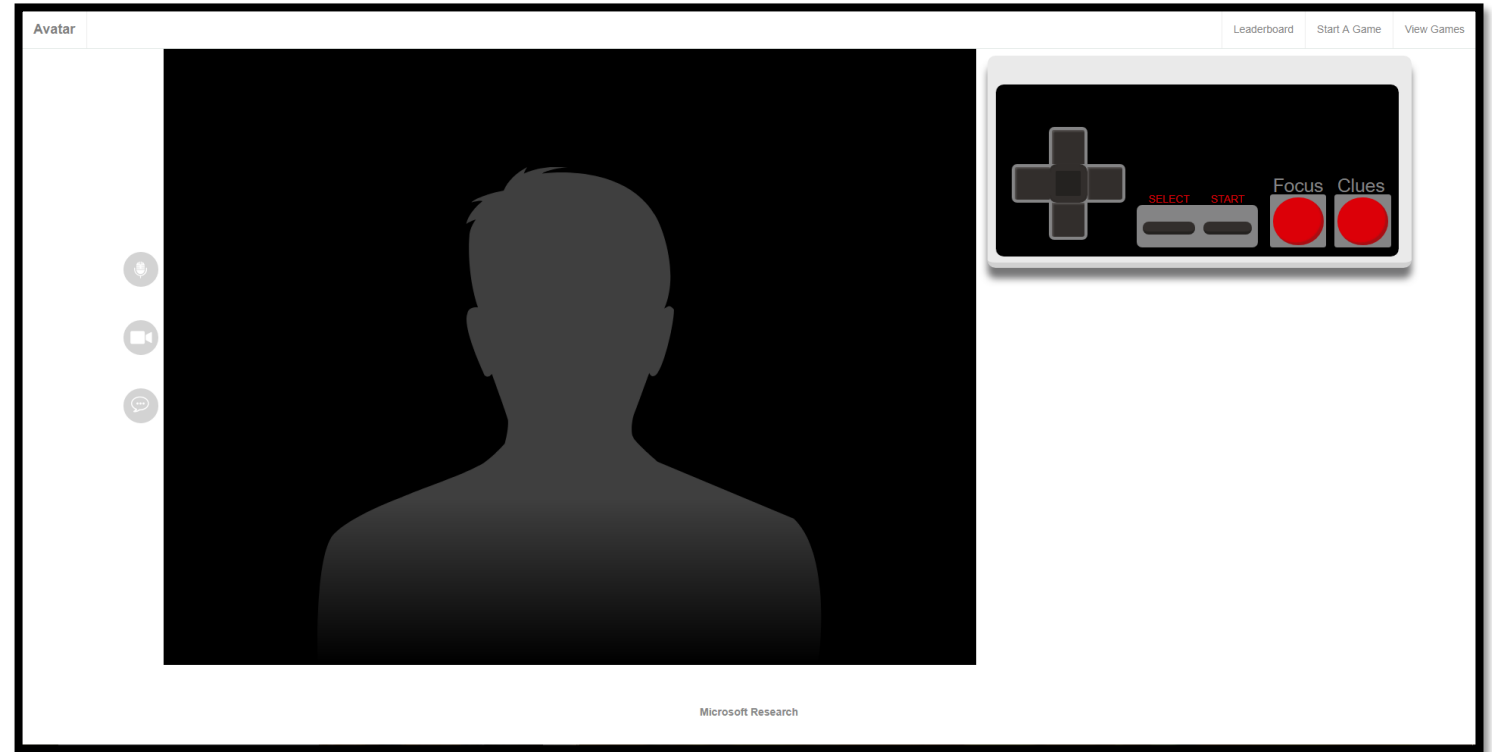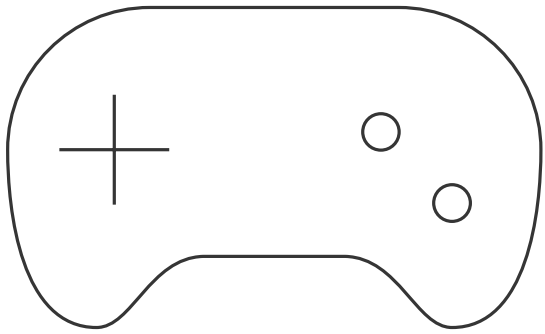
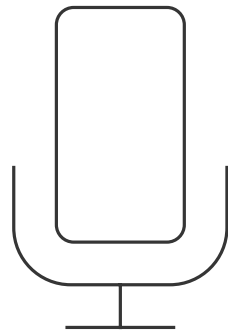# Mobile application for the streamers

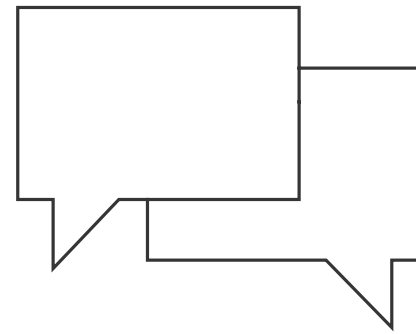*Avatars/Streamers* use a mobile application to stream their surroundings to the viewers.
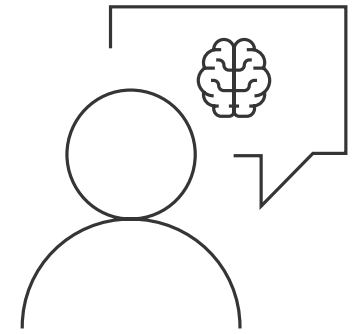
Exploration of communication modalities

Using a virtual joystick

Toggle-able Audio Streams

Text Messaging

Quick Replies

Preliminary User Study

1. Methodology
2. Design of the Escape Room Experiences
3. Data Collection & Analysis

Methodology

- 26 Participants (18-25 years)
- 4 Groups of 6-7 people each.
  - Each player in a group chooses a random numbers between 1-7.
  - Two numbers are chosen in the range by a computer, players are chosen as remote Hackers (Viewers).
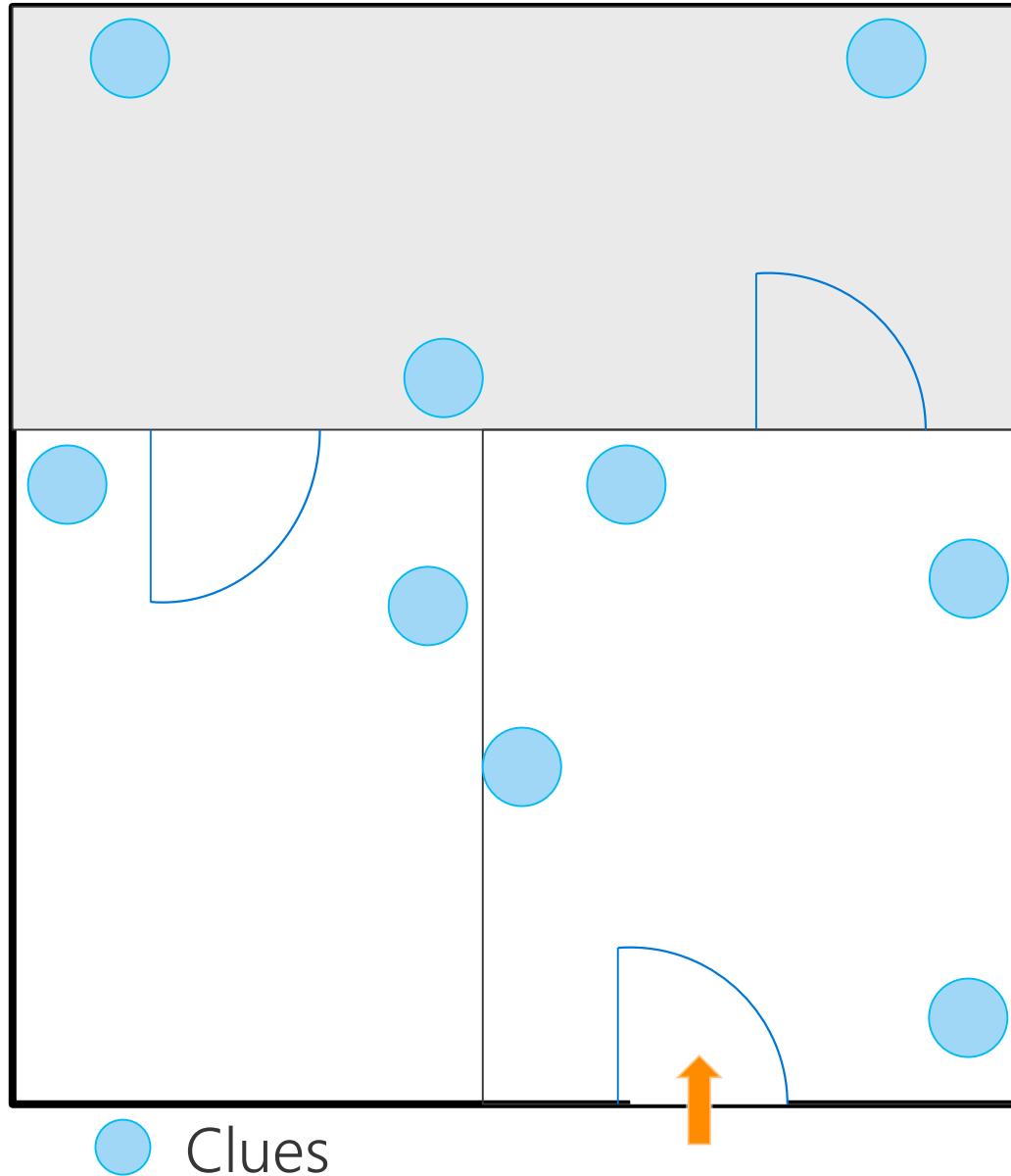 - The rest of the members are chosen as Avatars (Streamers).
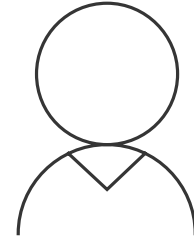
21 Male
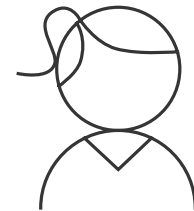
5 Female

Design of the Escape Room Experiences

Game Narrative:

- Help the thieves steal a valuable golden statue by collaborating with remote hackers.

Clues

Data Collection & Analysis

- Observation notes were collected using paper and pencil method
- The first person view from the streamer is recorded
- Questionnaire responses were obtained from the participants
- Additional telemetry including video & audio quality and the messages transmitted.

Results from the Study
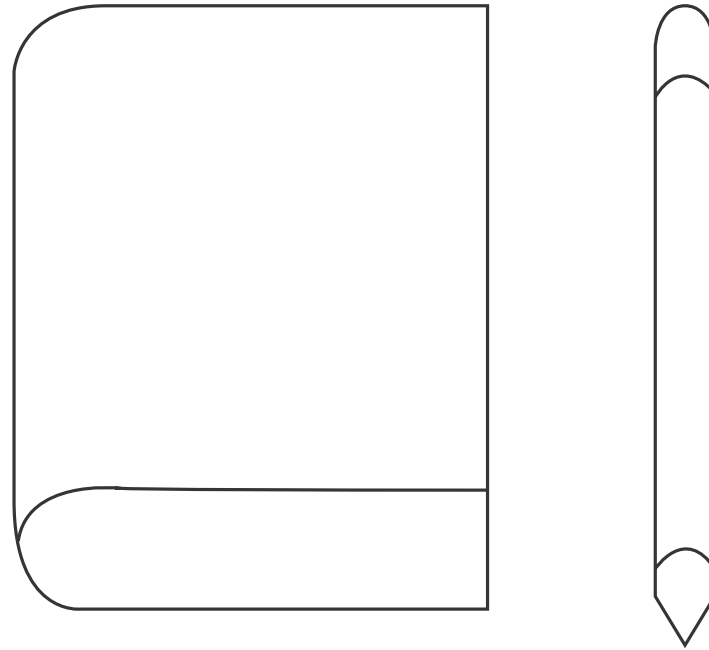
Snapshots of the game
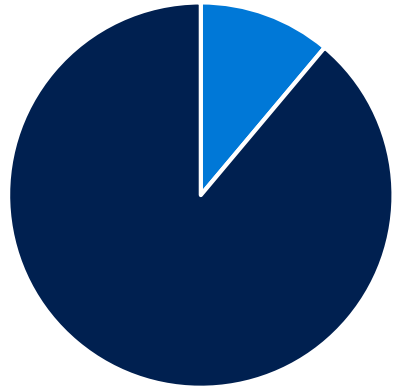
1h 34m
Average game play time

Previous Live Streaming Experience

- Experienced
- No prior experience
- Did not disclose

Group 4
Group 3
Group 2
Group 1

0%   20%   40%   60%   80%   100%

- Virtual Joy Stick
- Total Messages
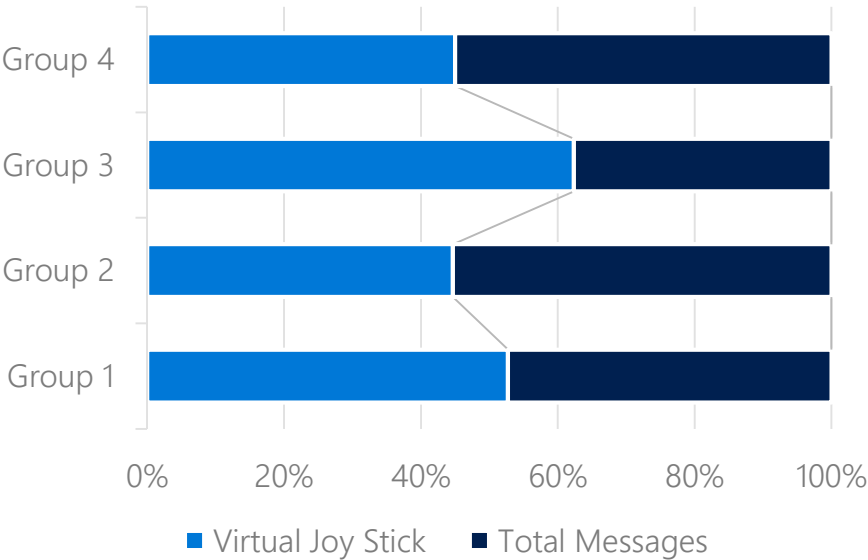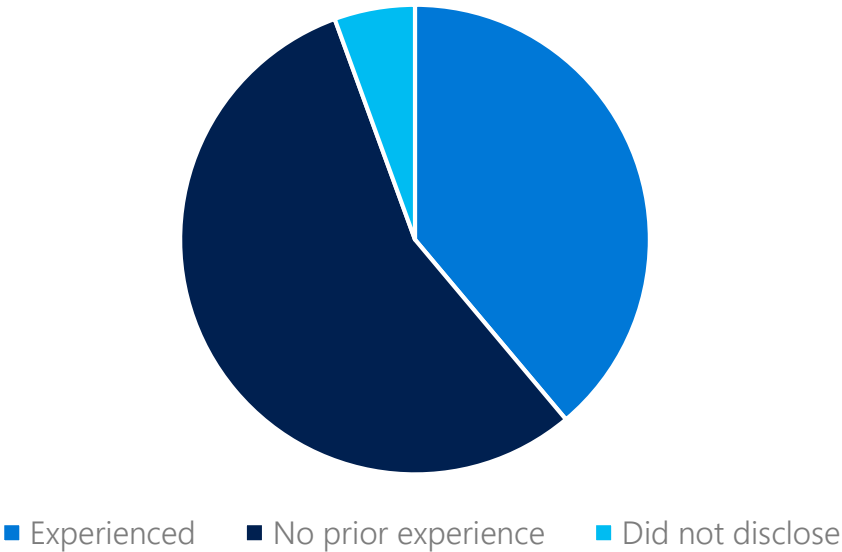
Snapshots of the game

Ability to control actions of streamer

■ Control ■ Collaboration

1/8 watchers felt that they were in control of the streamers' actions while the others felt it was collaborative
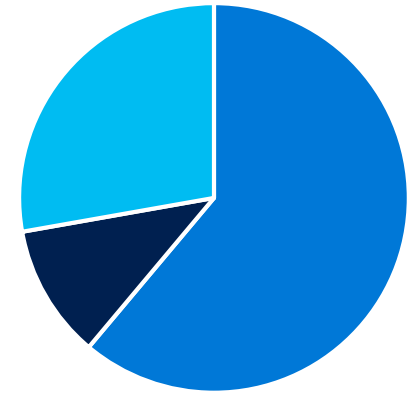
Decision makers in the group

■ Peers streaming ■ Remote Peers ■ Collectively

Most participants felt that the decisions in the group were taken collectively while a few others mention the viewers making decisions.

Streamers & Perception of Control

■ In Control of actions ■ Not in control of actions ■ Maybe

Most steamers felt that they were in control of their actions while a few felt that they were controlled.

Were Collaboration Modalities Effective?

- Game based modalities like virtual joysticks are effective
- Text messaging was primarily used to send critical messages.
- Toggle-able audio remains the most effective means and are used for a variety of reasons
  - Gaining attention when a streamer gets distracted
  - Toggle-able audio was left on after some on/off stages and resulted in more streamlined voice discussions
  - Users code switched language during their communication
- 'Quick replies' were the least used since the suggested replies were unrelated to the messages sent by text.

Were there any displays of trust/leadership?

- The streamers did not initially trust the remote collaborators
- The trust relationships changed after the help from remote collaborators solved the clues
- Streamers involuntarily started placing more trust in the viewers
- Leadership roles was played by the first player who solved a puzzle and continued that way

What about Miscommunications?

- Time constraints resulted in adoption of audio communication as the primary modality

- Momentary video loss resulted in lesser frustration than audio loss

- Poor connectivity and audio loss resulted in

  - Louder speech

  - Change of language used to communicate

  - Cursing (1 instance)

- Successes in solving a puzzle were rarely communicated and the remote team continues to solve the puzzle
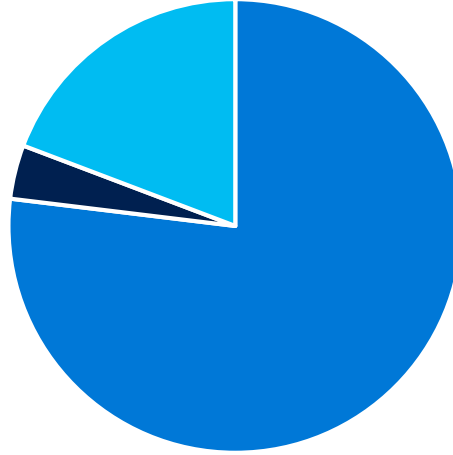
Understanding Safety & Privacy in ARGs
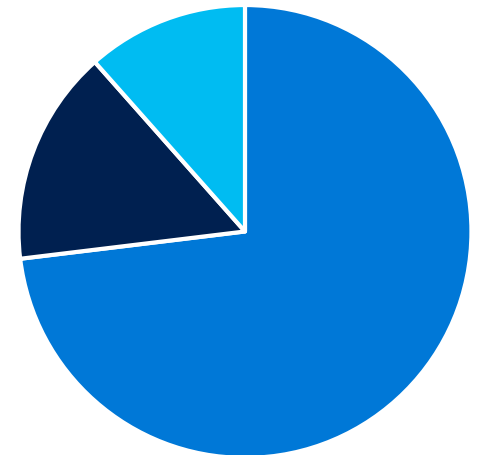
Player Group Willingness
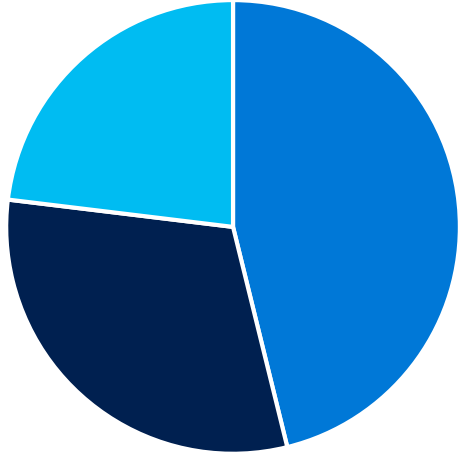
■ Playing with strangers   ■ Playing with friends   ■ Unsure

Willingness to Broadcast

■ Public Broadcast   ■ Unsure   ■ No

Comfort with platform moderators

■ Comfortable   ■ Uncomfortable   ■ Undecided

1. Viewers could be disrespectful to streamers
2. Coercing streamers to do something illegal
3. Safeguarding a stream from unwanted monitoring

Future Work

1. Explore interactions in developing countries with wider demographic of participants
2. Explore possibilities of enabling new earning opportunities via live mobile video crowdsourcing
3. Explore many-many interactive live video experiences

Thank You!

Related Work

1. Live Streaming Applications and Experiences.
2. Participatory Live Modalities
3. Specific experiences, e.g. escape room experiences