

MultiView: Improving Trust in Group Video Conferencing Through Spatial Faithfulness

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Introduction

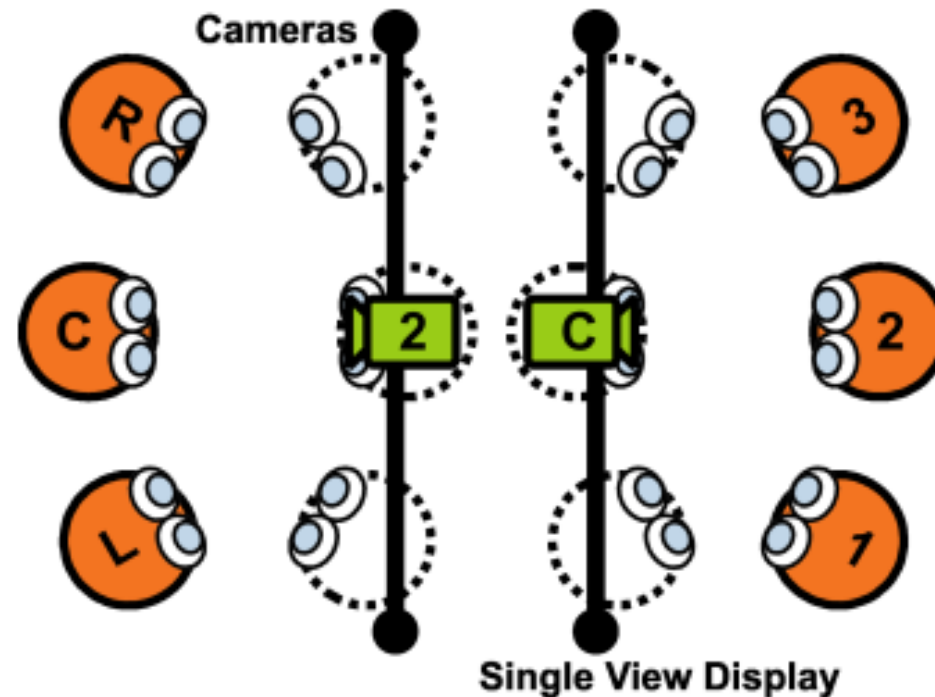
- ▶ Video conferencing:
 - ▶ Poor alternative to face-to-face meetings.
 - ▶ Used for group-to-group meetings where spatial distortions are increased.
- ▶ Effects of spatial distortions of nonverbal cues on *inter-group* trust formation.
- ▶ Usually video conferencing systems do a **poor job of preserving nonverbal cues** that are important in group activities.
- ▶ Spatial faithfulness plays a key role in influencing inter-group trust formation by comparing:
 - ▶ MultiView (directional video)
 - ▶ non-directional video
 - ▶ face-to-face meetings

Why do we need video meetings?



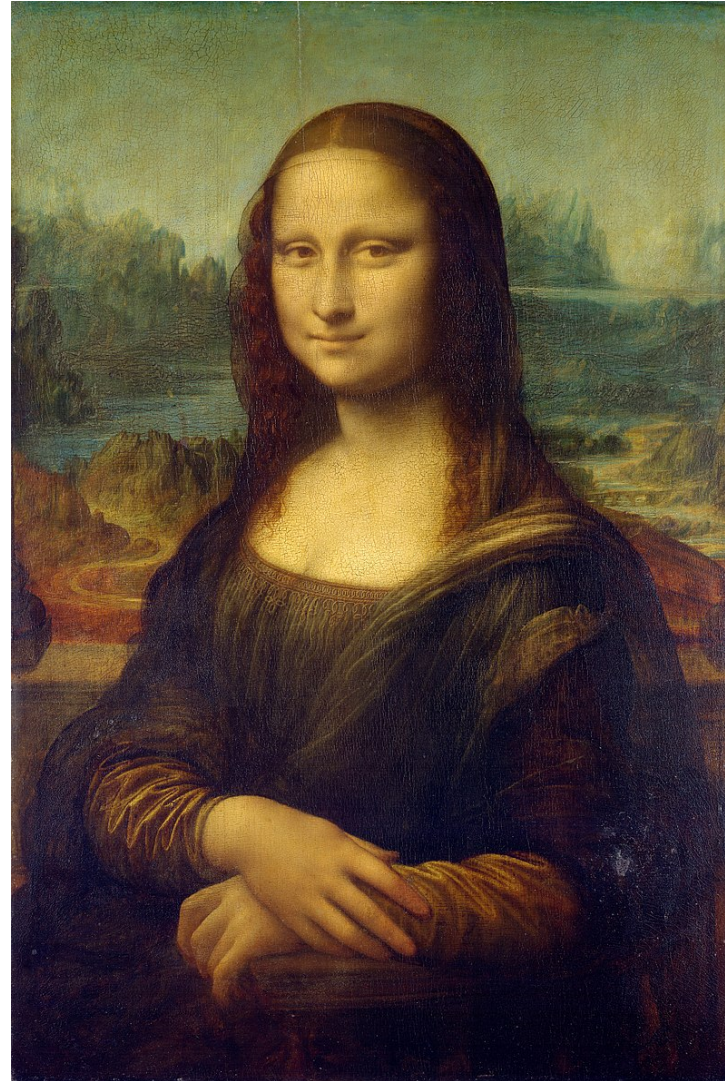
Non-directional video conferencing

- ▶ Each participant in the meeting has his own unique perspective defined by his position.
- ▶ Video is shared by all remote participants with a single view display.
- ▶ Remote participants, regardless of the viewing angle, will all take on a shared and incorrect perspective defined by the position of the camera. This is known as *perspective invariance*.



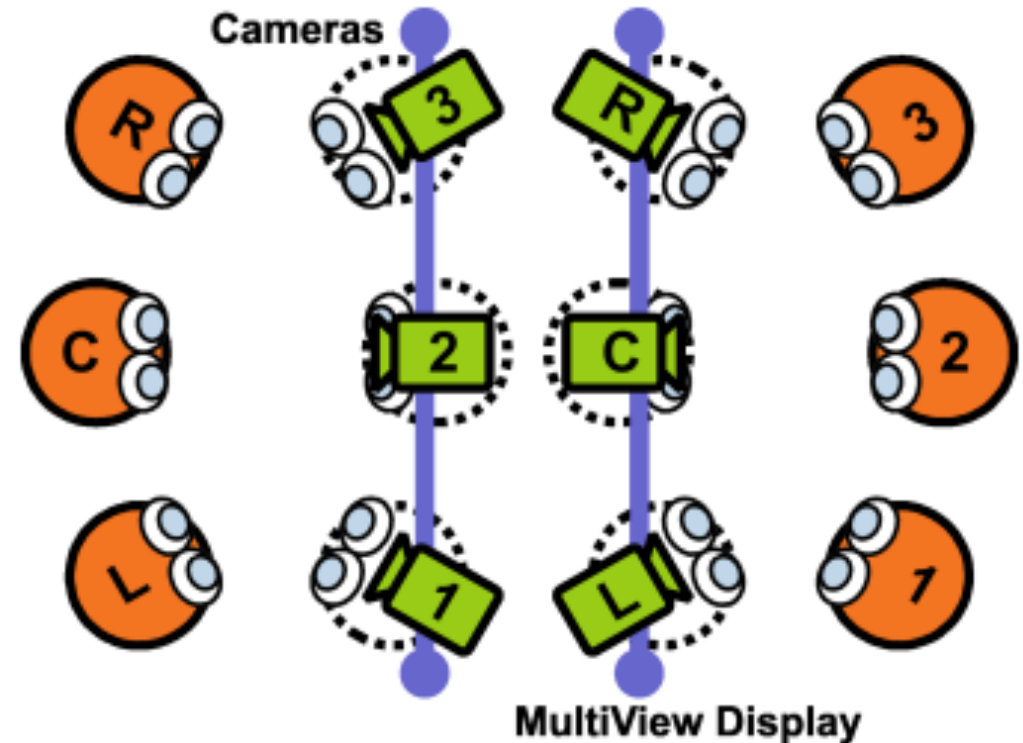
Perspective invariance

- ▶ *Mona Lisa Effect*, celebrating the eerie effect of Mona Lisa's eyes following you as you walk around.
- ▶ Each observer shares the same perception s.t it seems that Mona Lisa looks everybody in the eye.
- ▶ Inability to establish eye contact with one particular observer without simultaneously establishing contact with all others
- ▶ Will lead to miscommunication



Multiview design

- ▶ MultiView adopts a multiple viewpoint directional display that can simultaneously display different video streams to different participants based on their viewing position.
- ▶ Multiple cameras are used to capture unique perspectives for each participant.
- ▶ Each person will see a unique and correct perspective providing full spatial faithfulness for all participants in the meeting.



Non-directional vs Multiview perspective

- ▶ Three remote participants looking at position 1



Latest Multiview design

- ▶ Screen: 72"W x 32"H, 9:4 aspect ratio, so that we can use life-sized images.
- ▶ Camera: high resolution (1024x768 pixel) firewire cameras
- ▶ Projectors: XGA (1024x768 pixel)
- ▶ Distance: 8'
- ▶ Sound: single echo cancelling desktop conferencing microphone



Daytrader: a cooperative investment task (Rules)

- ▶ 2 groups, each group consisting of 2 or 3 participants
- ▶ groups play an unknown number of rounds
- ▶ in each round each group is given 60 credits
- ▶ Task: Each group must decide how many of their credits to cooperatively invest with the other group (**cooperate**) and how many they wish to save for themselves (**defect**).
- ▶ each round, a new group leader should make the final decision
- ▶ After every 5 rounds a “Rich Get Richer” bonus is awarded to the two groups. 60 credits are placed into the fluctuating market.
- ▶ Discussion is allowed at any point in time, either with groupmates or with the opposing group

Daytrader: a cooperative investment task

		Team A Investment	
		0	60
Team B Investment	0	60 / 60	45 / 105
	60	105 / 45	90 / 90

Hypotheses

- ▶ *Hypothesis 1 (H1): Groups meeting face-to-face will demonstrate higher levels of trust than groups meeting through non-directional video conferencing systems.*
- ▶ *Hypothesis 1a (H1a): Groups meeting face-to-face will show higher levels of **overall trust** than groups meeting through non-directional video conferencing.*
- ▶ *Hypothesis 1b (H1b): Groups meeting face-to-face will show reduced **delay in trust formation** when compared to groups meeting through non-directional video conferencing.*
- ▶ *Hypothesis 1c (H1c): Groups meeting face-to-face will show reduced **fragility in trust formation** when compared to groups meeting through non-directional video conferencing.*

Hypotheses

- ▶ *Hypothesis 2 (H2): Groups meeting through directional video conferencing will show higher levels of trust than groups meeting through non-directional video conferencing.*
- ▶ *Hypothesis 2a (H2a): Groups meeting through directional video conferencing will show higher levels of **overall trust** than groups meeting through non-directional video conferencing.*
- ▶ *Hypothesis 2b (H2b): Groups meeting through directional video conferencing will show reduced **delay in trust formation** when compared to groups meeting through non-directional video conferencing.*
- ▶ *Hypothesis 2c (H2c): Groups meeting through directional video conferencing will show reduced **fragility in trust formation** when compared to groups meeting through non-directional video conferencing.*

Method

- ▶ Experimental Social Science Laboratory (XLab) at University of California, Berkeley
- ▶ **Participants:** 169 participants: 110 females (65%), 59 males (35%), 156 students (92%), and 13 staff members (8%).
- ▶ 29 groups of 2 and 37 groups of 3
- ▶ **Treatment Conditions**
 - ▶ *Face-to-Face*
 - ▶ *Directional Video Conferencing*
 - ▶ *Non-Directional Video Conferencing*
- ▶ **Measurement Instruments**
 - ▶ *Task Performance Measure*
 - ▶ *Post-Questionnaire*
 - ▶ *Post Interview*

Procedure

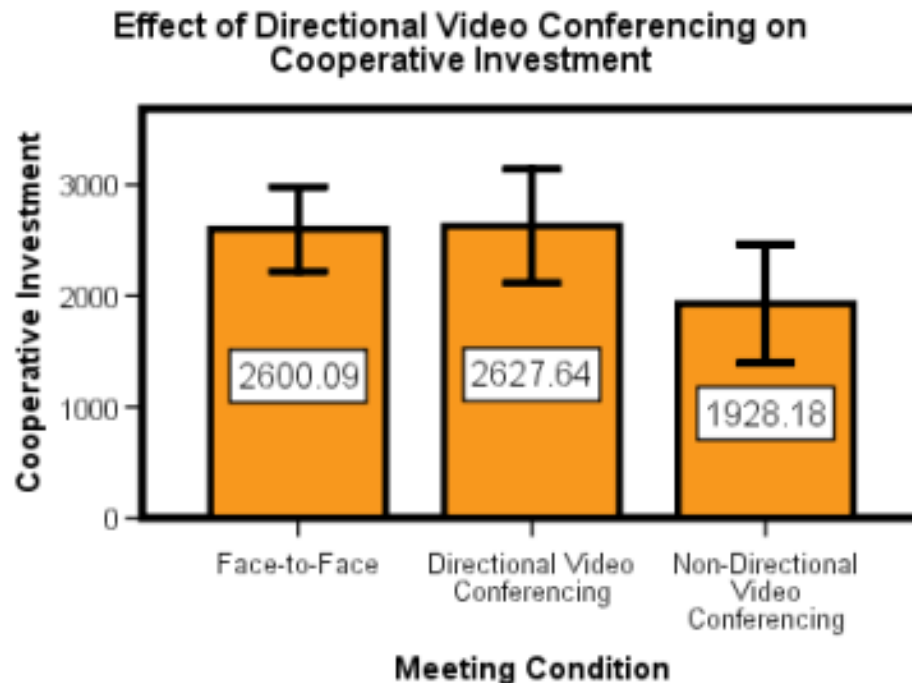
- ▶ 120 minutes for each session
- ▶ Upon arrival, each participant was immediately assigned to one of two groups, to avoid face contact with the other participants
- ▶ 30 min video presenting the rules of the Daytrader game
- ▶ After discussion the groups submit their investment amount to a fund manager
- ▶ The fund manager calculates each group's earnings and reports them to the respective groups.
- ▶ This portion of the experiment lasted for 45 minutes. All groups played at least 30 rounds.
- ▶ Each participant filled out the post-questionnaire individually and a post interview was conducted.
- ▶ Each participant was paid a minimum of 22.50\$

Results and analysis

- ▶ Overall Cooperative Investment
- ▶ Round-By-Round Cooperative Investment
- ▶ Post-Questionnaire
- ▶ Discussion

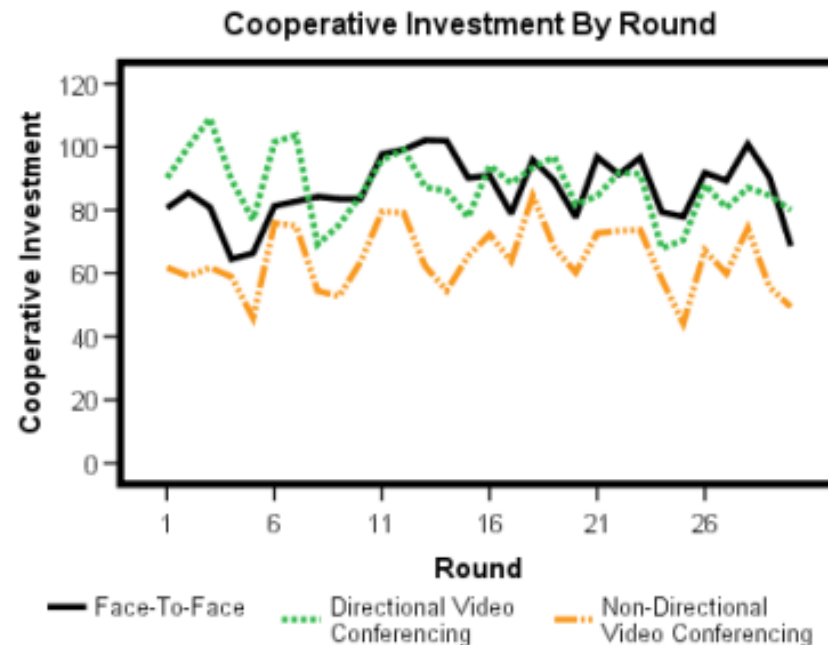
Overall Cooperative Investment

- ▶ *Overall trust* is measured by the total cooperative investment across the entire game.
- ▶ The sum of all cooperative investments by both groups for the first 30 rounds of each session. The maximum cooperative investment is 3600 credits.



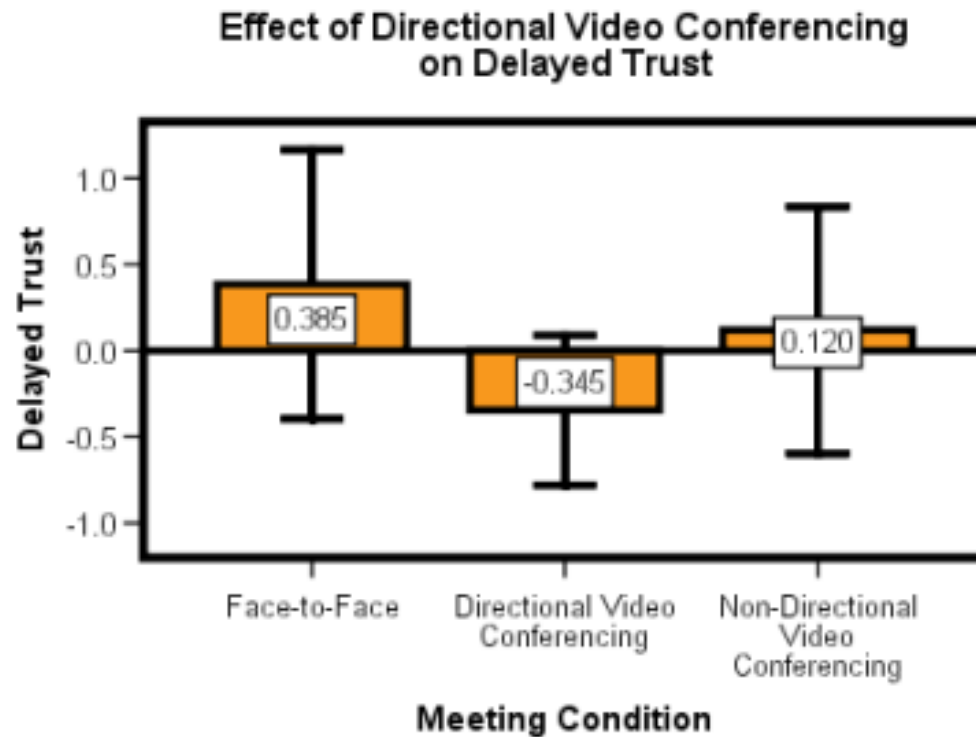
Round-By-Round Cooperative Investment

- ▶ For each round, we sum both groups' cooperative investments. The maximum cooperative investment per round is 120 credits (60 credits/group * 2 groups)
- ▶ Data presented in the Figure suggest Daytrader data exhibits two different phenomena:
 - ▶ *Delayed trust*, which is a function of the number of rounds since the start of the game
 - ▶ *Fragile trust*, which is a function of the number of rounds since the last discussion.



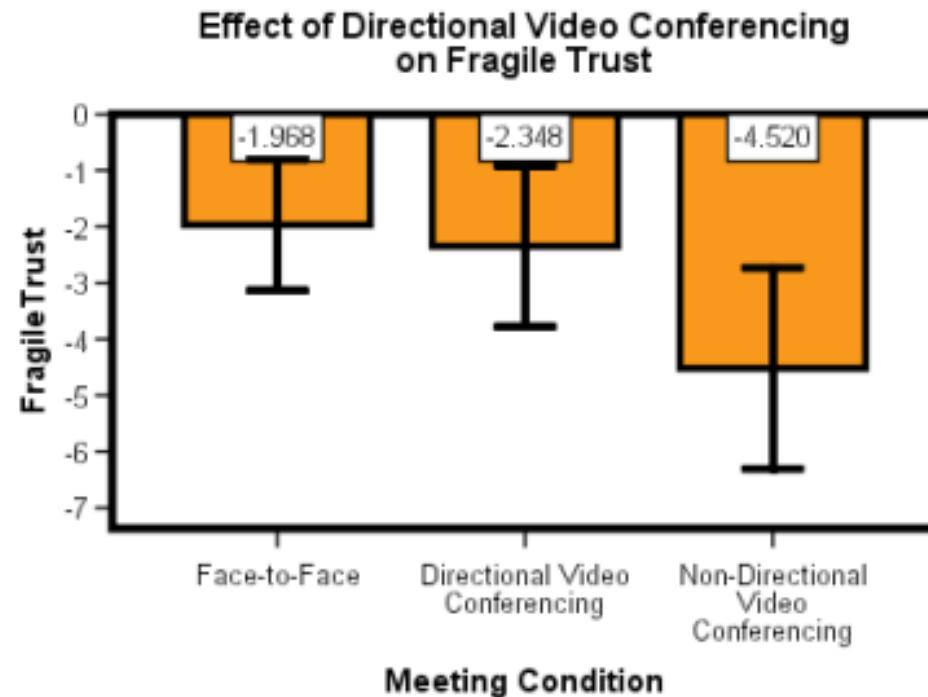
Delayed trust

- *Delayed trust* is the slope of a regression line between *cooperative investment* vs. *round*



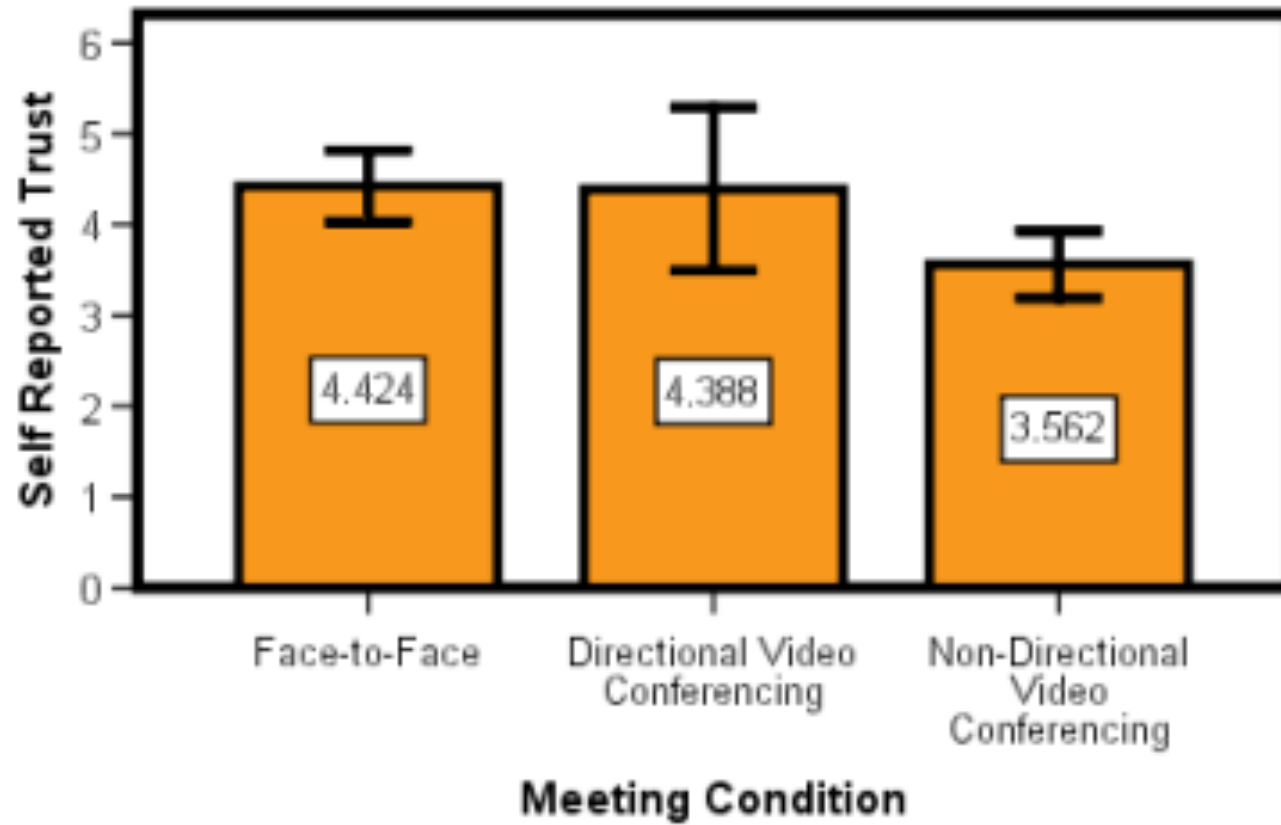
Fragile trust

- ▶ *Fragile trust* is the slope of a regression line between *cooperative investment* vs. *discussion distance* (number of rounds since the last 5-round discussion)



Post-Questionnaire

Effect of Directional Video Conferencing on Self Reported Trust



Discussion

- ▶ *Hypothesis 1a(H1a): Groups meeting face-to-face will show higher levels of overall trust than groups meeting through non-directional video conferencing.*
 - ▶ *Proved by “Overall Cooperative Investment” and “post-questionnaire”*
- ▶ *Hypothesis 1b(H1b): Groups meeting face-to-face will show reduced delay in trust formation when compared to groups meeting through non-directional video conferencing.*
 - ▶ *Not proved, there is no difference in delayed trust*
- ▶ *Hypothesis 1c (H1c): Groups meeting face-to-face will show reduced fragility in trust formation when compared to groups meeting through non-directional video conferencing.*
 - ▶ *Proved, groups meeting face-to-face tended to be more resilient to breakdowns in trust when compared to groups that met through non-directional video conferencing*

Discussion

- ▶ *Hypothesis 2a (H2a): Groups meeting through directional video conferencing will show higher levels of overall trust than groups meeting through non-directional video conferencing.*
 - ▶ Proved by “Overall Cooperative Investment” and “post-questionnaire”
- ▶ *Hypothesis 2b (H2b): Groups meeting through directional video conferencing will show reduced delay in trust formation when compared to groups meeting through non-directional video conferencing.*
 - ▶ Not proved, there is no difference in delayed trust
- ▶ *Hypothesis 2c (H2c): Groups meeting through directional video conferencing will show reduced fragility in trust formation when compared to groups meeting through non-directional video conferencing.*
 - ▶ Proved, there is a statistically significant difference in fragile trust between the directional and non-directional video conferencing conditions at a reduced level of confidence

Conclusion

- ▶ Introduced the design of a new video conferencing system which preserves many of the nonverbal cues lost in standard video conferencing systems by being spatially faithful.
- ▶ Examined the effects of spatial faithfulness on trust formation in a cooperative investment task and present two results.
- ▶ Groups meeting through directional video conferencing cooperated more than groups who met through standard video conferencing systems.

References

- ▶ David T. Nguyen, John F. Canny:
Multiview: improving trust in group video conferencing through spatial faithfulness. *CHI 2007*, April 28-May 3, 2007, San Jose, California, USA
- ▶ <https://www.youtube.com/watch?v=mDoRx9SAPIU&list=LLml1CVhDus6blpMoDZZFw8g>
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Thank you for your
attention!!!

Questions?