STQ Workshop

On QoE of a Videocall with Misaligned Camera(s)

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Presentation OUTLINES

- **Introduction**
- **Experiment design**
- **Result analysis**
- **Conclusions**

Introduction

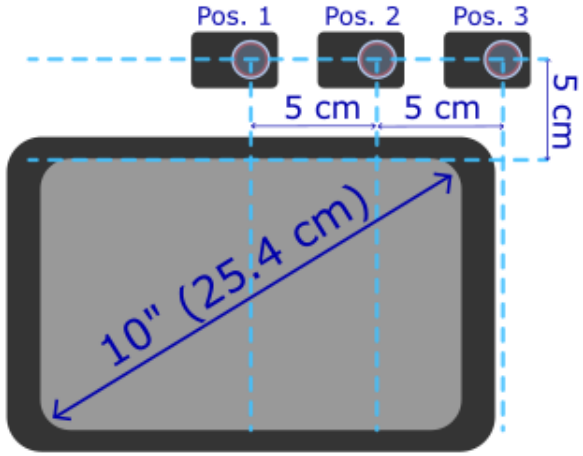
Eye contact:

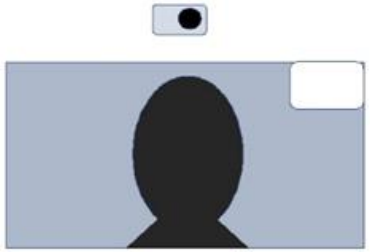
- essential part of human-to-human communication that carries a significant amount of non-verbal communication
- studied since early 60s
- average angular value perceived by two persons as a breach of eye contact is 2.8°
- Bell Labs identified 4.5° for horizontal misalignment and 5.5° for vertical misalignment for loss of eye contact
- Various compensations for videoconferencing available – SW/HW

(pictures: Intel, Masa Kawashima)

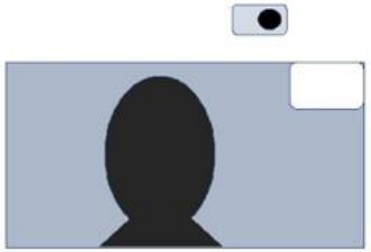
Experiment design 1

- Horizontal camera misalignment investigated only, keeping the vertical misalignment fixed.
- Assuming symmetry in the perceptual impact of camera horizontal misalignment, it was decided to move the camera between the center and right positions only.
- Three rooms conforming to ITU-T P.800 and P.910, Skype video-conference set to „Speaker view“, 3x tablet 10.1“ PC (Win10), Full HD Ausdom AW635 webcams, Plantronics Blackwire 5000 headsets.





0cm



5cm

10cm

Experiment design II – scenarios

- 9 different partially-defined conversational scenarios (ITU-T P.805, P.920)
- Role playing in different contexts – leading person, consensual person, opposing person. Example:

Room 1
You are a team leader in a company and you are preparing your team meeting scheduled for next week. It is possible to hold it either in person or by teleconference, or to postpone it to a later date. Discuss it with your colleagues, weigh the pros and cons of all the options together and make a decision.

Room 2
Your boss is preparing a meeting of the team of which you are a member. It is scheduled for next week with your attendance in person, but it may be changed to a teleconference due to the risk of quarantine or postponed to a later date. Your preference is to postpone it because its timing is not convenient for you. However, as the meeting was announced long in advance, you do not want to share this reason with your colleagues . Try to justify postponing the meeting in other ways, e.g. the epidemiological risks of a physical meeting and the inconvenience of videoconferencing during Internet outages, etc.

Room 3
Your boss is preparing a meeting of the team of which you are a member. It is scheduled with your personal attendance for next week but may be changed to a teleconference due to the risk of quarantine or postponed to a later date. Your preference is to change it to a teleconference because you are already counting on the date and do not want to block later dates, but you do not want to tell your colleagues, especially your boss, this reason. Try to justify the videoconference, e.g. by the risks of a physical meeting and the need to arrange the meeting as soon as possible (not to postpone), etc.

Experiment design III – Subjects & Scales

- 99 teleconference calls of 3 participants each, 33 participants (μ=33.1y, σ=12.8y)
- 9 different conversations scenarios, camera positions changed pseudorandomly

EFFECTIVENESS CRITERIA

Opinion Score	*How would you rate the video call effectiveness?*
5	Excellent / Very effective
4	Good / Effective
3	Fair / Somehow effective
2	Poor / Almost ineffective
1	Bad / Ineffective at all

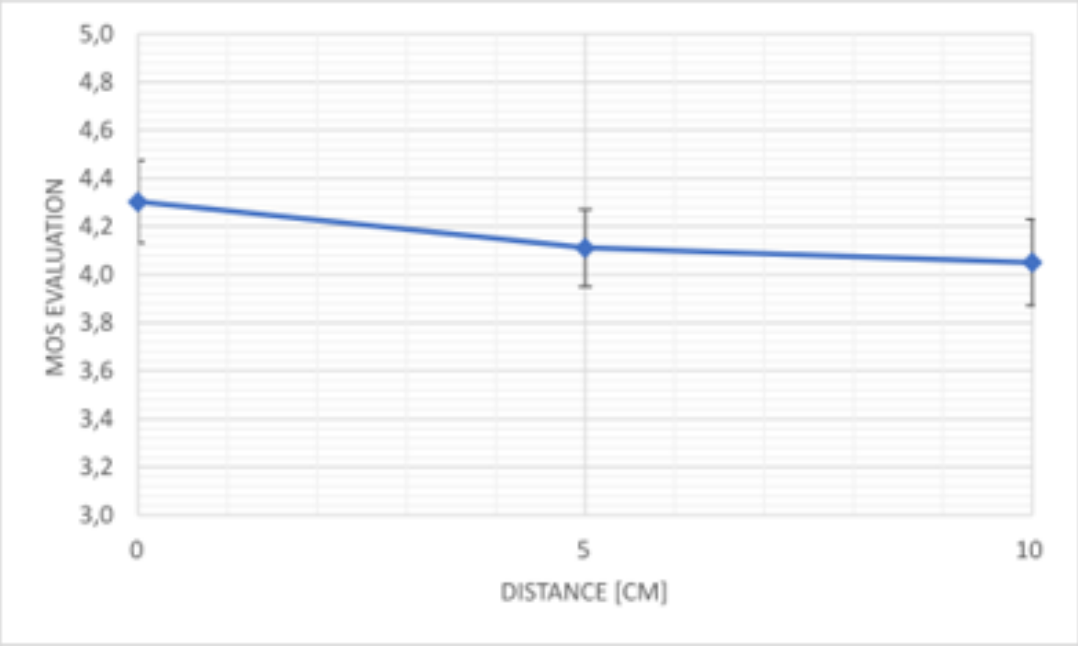
ENGAGEMENT CRITERIA

Opinion Score	*How would you rate the video call engagement?*
5	Excellent / Very engaging
4	Good / Engaging
3	Fair / Somehow engaging
2	Poor / Almost not engaging
1	Bad / Not engaging at all

Experimental Results

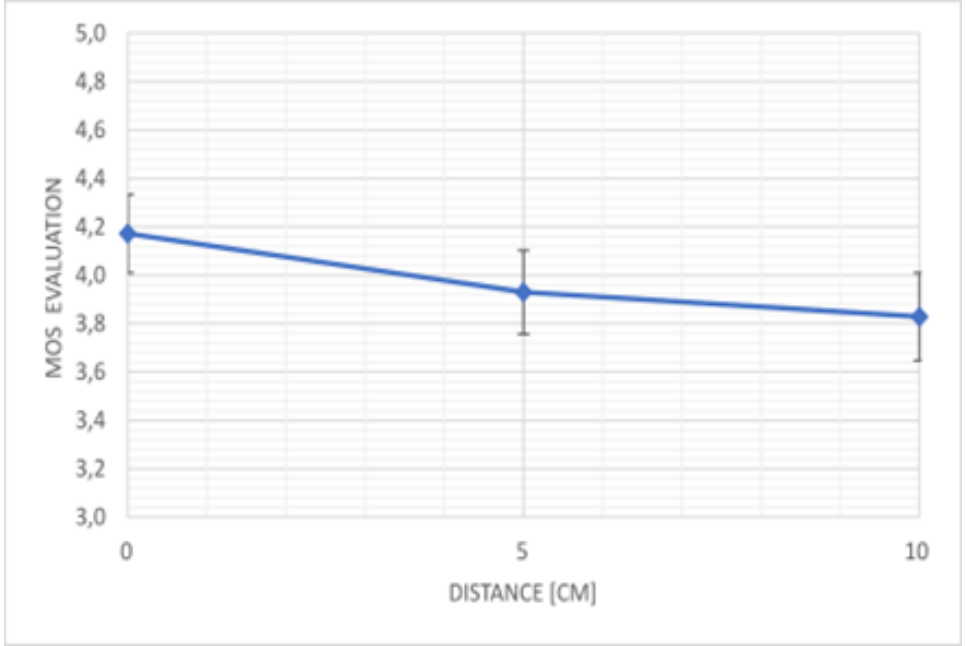
Effectiveness

Horizontal misplacement	MOS	STD	CI95
0cm	4.303	0.870	0.171
5cm	4.111	0.811	0.160
10cm	4.051	0.910	0.179



Engagement

Horizontal misplacement	MOS	STD	CI95
0cm	4.172	0.821	0.162
5cm	3.929	0.879	0.173
10cm	3.828	0.920	0.181



Experimental results – statistical analysis

- Opinion scales (MOS) for Effectiveness and Engagement may not be equidistant – parametric analysis (ANOVA, T-test, Tukey-Kramer …) not suitable
- (Non parametric) Friedmann test:
  - Effectiveness $\chi2(3) =7.091, p<0.029$
  - Engagement $\chi2(3) =2.561, p<0.278$
- Wilcoxon signed-ranks test

	0 cm	5 cm	10 cm
0 cm	-	**55.5/58***	**81.5/89***
5 cm		-	**104/73**
10 cm			-

  - Benjamini-Hochberg correction at Q =0.057 (Bonferroni correction too conservative)

	(i/m)Q	p	Significant?
0cm, 10cm	0.019	0.029298	YES
0cm, 5cm	0.038	0.037028	YES
5cm, 10cm	0.057	0.301085	NO

Other Experimental Results – dependency on previous user experience with videoconferencing (19 experienced, 10 rare users, 4 never using)

Effectiveness

	MOS	STD	CI95
Not at all	**4.11**	±0.222	±0.126
Rare	**3.88**	±0.553	±0.198
Frequent	**4.32**	±0.542	±0.141

Engagement

	MOS	STD	CI95
Not at all	**3.75**	±0.516	±0.292
Rare	**3.82**	±0.628	±0.225
Frequent	**4.11**	±0.634	±0.165

Conclusions

- Even 5 degrees of horizontal misalignment causes a statistically significant drop in Effectiveness.
- The identified dependencies between Effectiveness and angular horizontal misalignment give design rules for multimedia hardware designers or integrators and enable existing or future HW solutions optimization (office or home office communication equipment placement, cockpit designs deploying embedded cameras, etc.).
- Many open points vertical remain subject for further study: misalignment, task type, private (family) calls, …

THANK YOU FOR YOUR ATTENTION!

QUESTIONS?