VISUALIZATION LABORATORY
ACADEMIC CENTER FOR COMPUTING AND MEDIA STUDIES
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3D VIDEO COMMUNICATION FOR VIRTUAL REALITY TELECOMMUNICATION SYSTEM (VRTS)

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Presentation Outline

- Overview
- Research Objectives
- First Prototype
- Experimental Setup
- Evaluation Booths
- Completed Works & Results
- Future Works

Overview

- to realize VRTS for the audio and visual information
- users shall feel as if they were having face-to-face conversation through a window
- application of 3D video technologies especially through cameras display systems
- the 3D effects perceived are to enhance the accuracy of visual information

Research Objectives

- to come out with basic hardware and system design specifications
- through several tests and evaluations on experimental system
- first prototype development based on basic specifications
- testing and performance evaluations of first prototype towards second prototype development

First Prototype

SYSTEM COMPONENTS OF 3D VIDEOPHONE FOR AUDIO AND 3D VIDEO INFORMATION

System component	Type of information	
	Audio	3D video
Sensor	• Microphones	• 3D camera
Processing	• Audio mixer	• Video Mixer
	• MPEG-2 encoder & decoder	• MPEG-2 encoder & decoder
	• Power amplifier	• Video line doubler
Actuator	• Speakers	• 3D LCD monitor

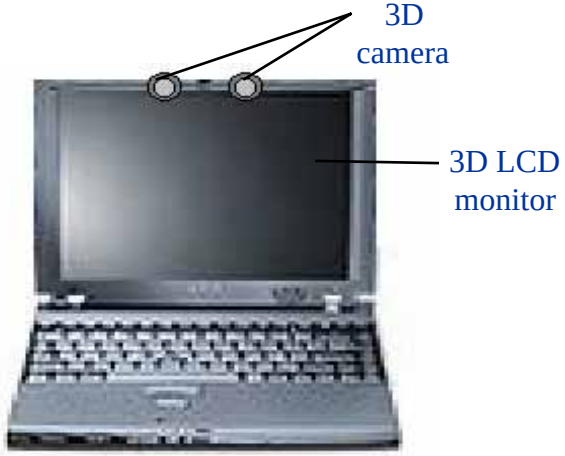


Illustration of a notebook PC as the core hardware for the proposed 3D videophone.

Experimental Setup

- one-way setup: adopted in our first set of evaluations

  - works completed

- two-way setup: current experimental setup and to be adopted in coming system testing and evaluations

  - this setup is installed in evaluation booths

Experimental Setup

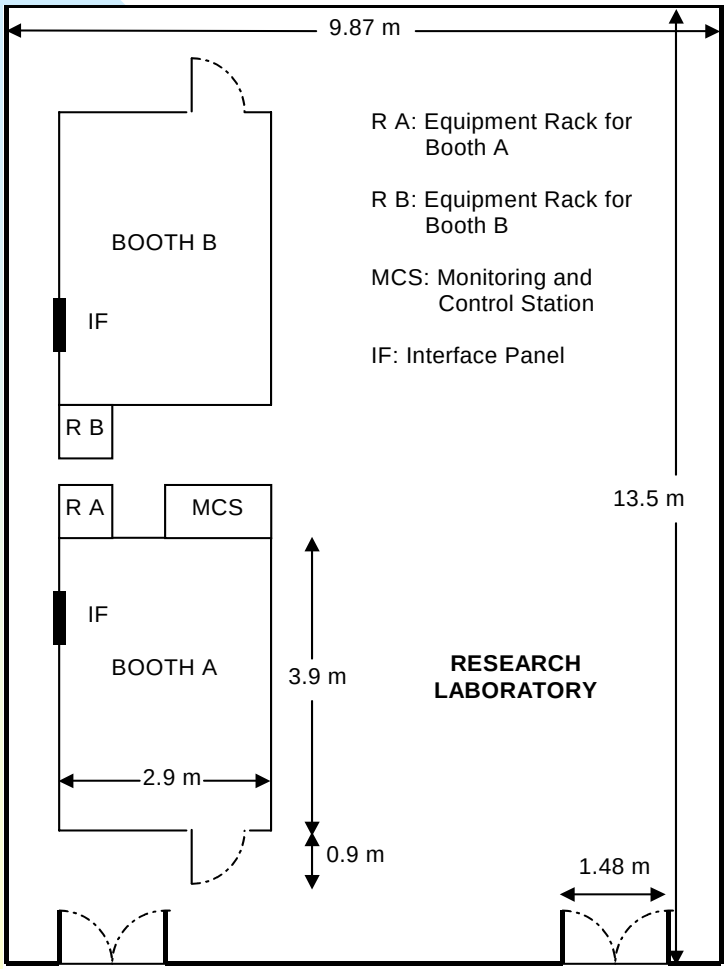
SYSTEM COMPONENTS OF 3D VIDEOPHONE FOR AUDIO AND 3D VIDEO INFORMATION

System component	Type of information	
	Audio	3D video
Sensor Processing	• Microphones • Audio mixer • MPEG-2 encoder & decoder • Power amplifier	• 3D camera • Video Mixer • MPEG-2 encoder & decoder • Video line doubler
Actuator	• Speakers	• 3D LCD monitor

Evaluation Booth

- to emulate communication between two persons at distant apart
- built in research laboratory with sufficient level of sound proof capability
- interior surroundings that are conducive, comfortable, safe and effective for lengthy evaluations
- installed with the 3D system and other necessary audio visual systems for monitoring purposes

Evaluation Booth



The layout of Active Booths in our research laboratory (not to scale).

Evaluation Booth

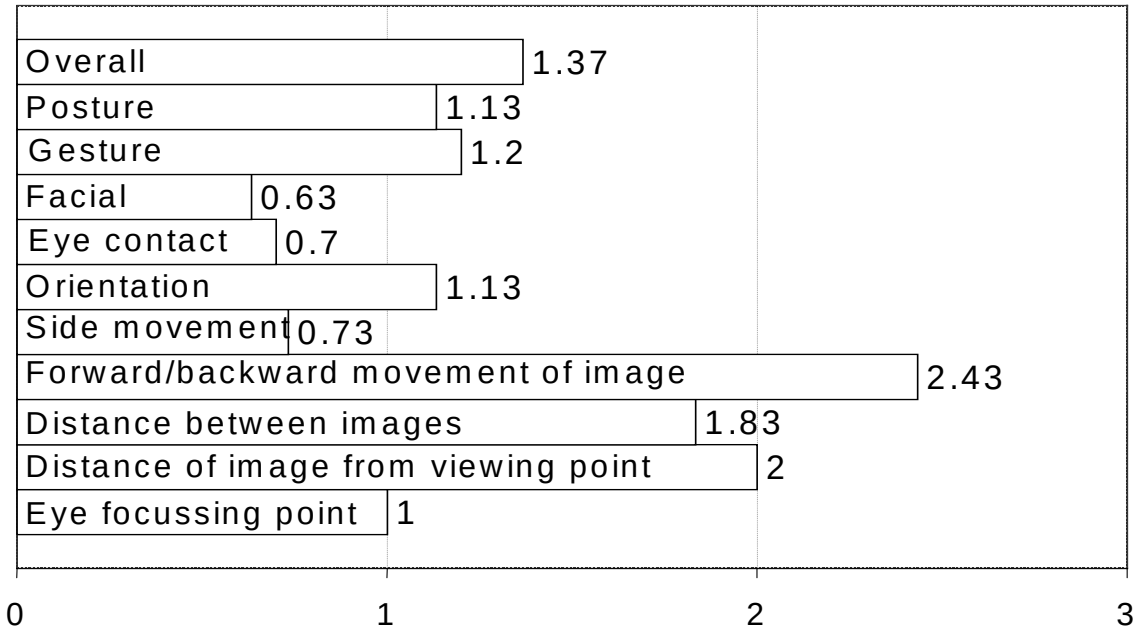
Completed Works 1

- comparison between 2D & 3D video which one can represent information much closer to natural conversation
- subjective assessment, comparison scale, 30 assessors
- assessors were shown a recorded sample of a person having conversation
- evaluation done based on assessors own judgement

Results 1

COMPARISON SCALE

Scale	Quality
-3	Much worse
-2	Worse
-1	Slightly worse
0	The same
+1	Slightly better
+2	Better
+3	Much better



The average scale of each evaluation item.

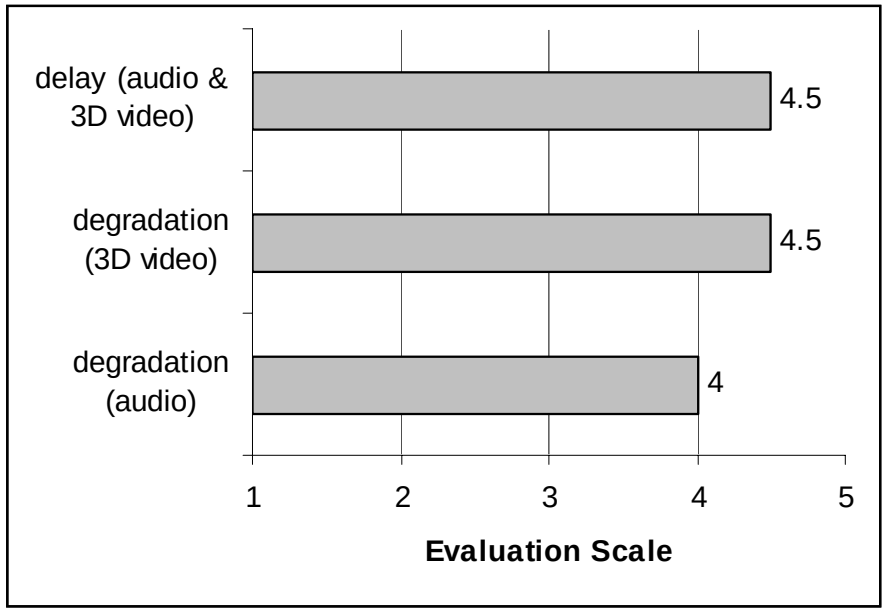
Completed Works 2

- evaluation of transmitted 3D video due to emulated ATM network impairments
- cell error rate (CER), cell loss rate (CLR), cell misinsertion rate (CMR), cell delay variation (CDV) and cell transfer delay (CTD) introduced through ATM impairment emulator
- subjective assessment, 21 assessors, five-grade scale and similar recorded sample as in previous evaluation

Results 2

ITU-R QUALITY AND IMPAIRMENT SCALES

Five-grade scale	
Quality	Impairment
5 Excellent	5 Imperceptible
4 Good	4 Perceptible, but not annoying
3 Fair	3 Slightly annoying
2 Poor	2 Annoying
1 Bad	1 Very annoying



Overall Performance of audio and 3D video due to all 5 categories of ATM network impairment according ITU-T Recommendation Performance Objectives.

Future Works 1

- qualitative and quantitative evaluations of the two-way experimental setup
- qualitative categories:

  (i) reliability, (ii) level of comfortable and (iii) user friendly
- quantitative categories:

  (i) efficiency, (ii) precision of information and (iii) comprehension level of information

Future Works 2

- system testing and performance evaluation through available broadband networks
- range of speed e.g. 384kbps to 2Mbps for TMNet Streamyx.
- to be performed using the evaluation booths
- evaluation to be done by two assessors communicating at real time basis

Future Work 3

- investigation on the optimum lenses separation for 3D camera system
- figure out the best camera position to minimized the occurrence of loss of eye contact in video communication
- this work require special hardware
- currently at the initial stage of hardware development

THE END

Thank you for your kind attention