Future of Endoscopy, Updated

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Abstract

This paper covers research based on a case study comparing *CAD* and *Endoscopy* in exploring, generating and illustrating architectural designs. Findings are compared to the former evaluation to study the trend how Endoscopy and CAD stand to each other.

Background

"Future of Endoscopy" [1] is a paper putting down the researcher's own evaluations how he sees the usefulness of architectural endoscopy versus CAD in teaching architectural design. The emphasis was not only to compare the current state of both, Endoscopy and CAD, but to predict the potential of them in the near future. This updated version is based on the experience gathered in the research "Comparing CAD and Endoscopy in Exploring, Generating and Illustrating Architectural Designs" by Ranulph Glanville [2] and Petri Siitonen. The updated version is perhaps somewhat wrong in choice for words, because the issue here is more of testing a theory in practice. Also, the original paper refers to the future endoscope which unfortunately does not yet function as a whole device; it is still under development.

The Comparison

The evaluations for the updated table are gathered from surveying students at work and also from student interviews held at the "Design-by-Modelling-Course" at the Department for Architecture at Tampere University of Tech-

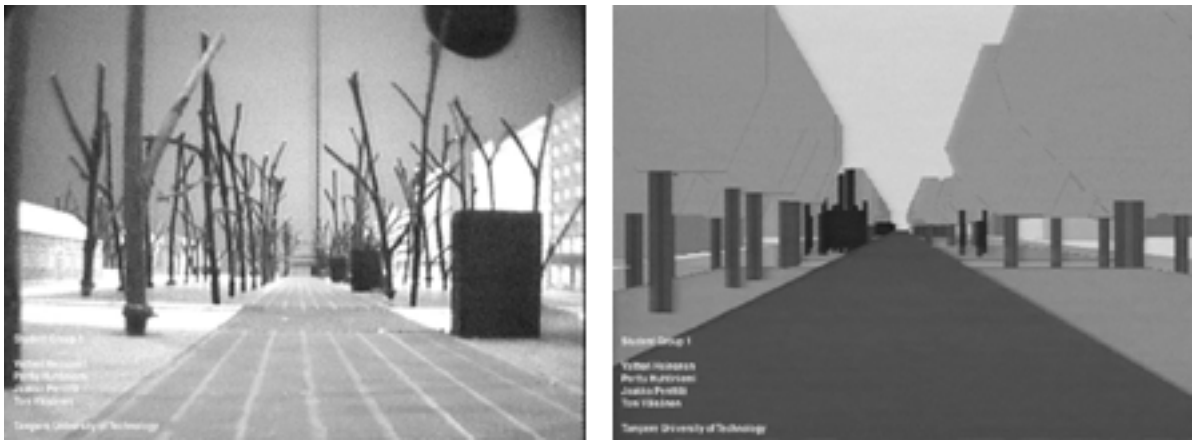

Fig. 1 Results of Group 1.

nology in 1994-95. Students were first and second year architecture students with no or little experience either on CAD nor endoscopy. We felt this was a fair basis for the comparison because once you learn to master one method it is much harder for another approach to gain ground. Students were not directly asked the questions on the table but were interviewed more generally on their experience of using endoscopy and CAD. Students were also observed how they use the equipment provided; they were instructed how to use the Tampere Department of Architecture endoscope and Virtus Walkthrough [3] CAD program but on purpose left alone to approach the design task itself.

Fig. 2 Results of Group 3.

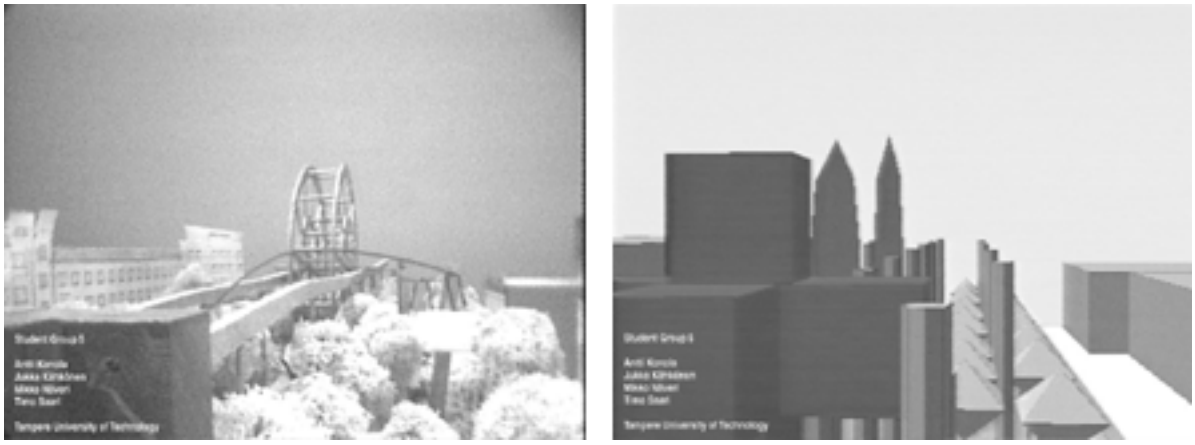

Fig. 3 Results of Group 5.

The Competitors

The Tampere Department for Architecture's endoscopical device is now already more than ten years old. However, it is still working reliably. Basically the endoscope has x,y,z-movements and free rotation, a car-like interface and simultaneous videotape recording capabilities. It is missing tilt-movement, repeatability of the route, computerized light control and collision prevention. It is also somewhat robust on its movements. The *Virtus Walkthrough* was

chosen to represent a CAD equal to the Tampere endoscope. It claims to be made for architectural walkthroughs and visualizations. Virtus Walkthrough differs from the rest of the CAD programs for its ability to produce real-time walkthroughs even with a mediocre computer. It also has simple modeling rules and the interface is quite friendly for a novice. It runs on both *Macintosh* and *Windows* operation systems and the files are interchangeable with each other. The following table summarizes our findings on comparing Endoscopy and CAD.

ENDOSCOPY vs. CAD

MODELLING

• skills needed	%	√	Physical models are present all the time from the beginning of their making. Using CAD one always has to tackle with an operation system first to gain access to modeling. And even if we consider it to be common literacy to know a computer operation system – one still has quite a long way to adopting the computers way of thinking when modeling, even with an "easy CAD" like Virtus Walkthrough. One of our student groups lost their whole model, and for good, because they hadn't backed it up! On the other hand doing a second job with CAD is considerably easier and a lot more rewarding for a student.
• equipment	%	√	In CAD for twenty students you need twenty computers and software lisences!
• accuracy	√	%	In CAD for twenty students you need twenty computers and software lisences!

STAGING

• adding people	√	√	Both way people look dead, you cannot animate humans in real time animation.
• adding trees etc.	%	√	Trees are typically quite problematic for CAD; realism or the number of trees can easily "freeze" any CAD system.
• using backgrounds	%	%	In endoscopy a lot of space is needed and large backgrounds can be tedious to produce. In CAD controlling the backgrounds behaviour with perspective can be difficult.
• using materials	%	%	Endoscopy; hard to make, but easy to use. CAD; flexible, but limitations to vast use and usually quite hard to define.

LIGHTING

•light properties	%	√	Simulating real world lights is typically not possible with CAD programs. Same goes for inter-object illumination that is not possible or very computer intensive to produce. In Endoscopy general lighting is quite easy to create and control but individual miniature light fixtures are difficult to set up.
•number of lights	√	√	In Endoscopy it is quite tedious to have a lot of lights. In CAD adding lights will increase the hardware requirements –to the second degree as a general rule.
•sun simulation	%	%	Can be done in both.

ANIMATING

•moving real time	%	√	CAD typically has limitations.
•control of movement	%	√	This is more the question of interface for both.
•restrictions of moves	√	%	Endoscopy; problem for having (not going through doorways) CAD; problem for not having (going through everything)
•repeatability	%	%	Possible for Endoscopy also.

INTERFACE

•using mouse	√	√	They both need something else.
•using "video-helmet"	%	%	Both possible (not yet tested).
•using 3D-sound	%	%	Both possible (not yet tested).

PICTURE QUALITY

•high res. stills	%	%	Both possible
•VHS-quality	%	%	CAD has problems with 25/30 frames/second
•SVHS- and beyond	%	√	In CAD typically frames have to be precalculated
•Stereo display	√	%	Endoscopy; technically demanding. CAD; easier, but you have to double your investments to retain quality

DISTRIBUTION

•in digital form	%	%	Video to digital -converters are widely and inexpensively available.
•in video form	%	%	And vice versa (see above).

MAKING CHANGES

• while shooting	%	%	Endoscopy is more flexible for sudden changes in lighting and small details. However, major changes are typically easier with CAD without redoing everything.
• editing the route	%	%	Matter of interface, endoscopy needs computer controlled motion.

COSTS AND MAINTENANCE

• cost for real-time	%	%	PC-CAD has evolved rapidly and semi-real-time is nowadays possible quite inexpensively.
• cost for maintenance	%	%	PC-CAD is inexpensive, Unix systems quite costly. For endoscopy one needs specialized personnel.
• cost versus speed	%	√	Speed is not a cost adding feature in endoscopy, where as in CAD one pays dearly for extra speed.

FEEL FOR ARCHITECTURE

• feel for space • feel for materials • feel for reality	% % %	√ √ √	In endoscopy you are dealing with tangible objects. In CAD you are using mathematical representations of objects, points, lines and polygons. This still makes a difference.

SHARING

• sharing in education	%	√	Endoscopy has been proved to be a very social working technique in educational group work. CAD work is typically very lonely. Even CAD networking is targeted for sharing work over great distances, not with the person next to you.
• sharing in presenting	%	%	Endoscopy works naturally in all environments where video technology is present. CAD typically has to be converted technically to be able to be shown for larger audiences.

FINAL SCORE 27/20 Endoscopy is the winner, but CAD is gaining

Notes and References

[1] Siitonen, Petri. “Future of Endoscopy”, in: Seppo Aura (et al.), *Endoscopy as a Tool in Architecture*. Tampere, 1993, p. 181-184

[2] Ranulph Glanville, Centre for Research and Development in New Media University of Portsmouth (UK).

[3] Mac/Windows CAD program by Virtus Corporation Inc., NC (USA).