

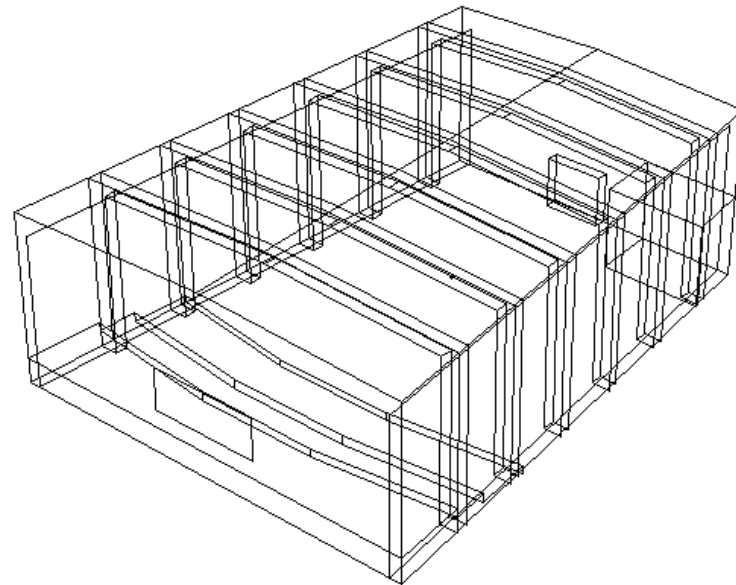
Methods for Designing Room Acoustics in the Past and in the Future

Andor T. Fürjes

*TU Budapest, Department of Telecommunications
Laboratory of Vibroacoustics*

Éva Arató-Borsi

Hungarian Radio Budapest



International Békésy Centenary Conference on Hearing and Related Sciences

Budapest, 1999 June

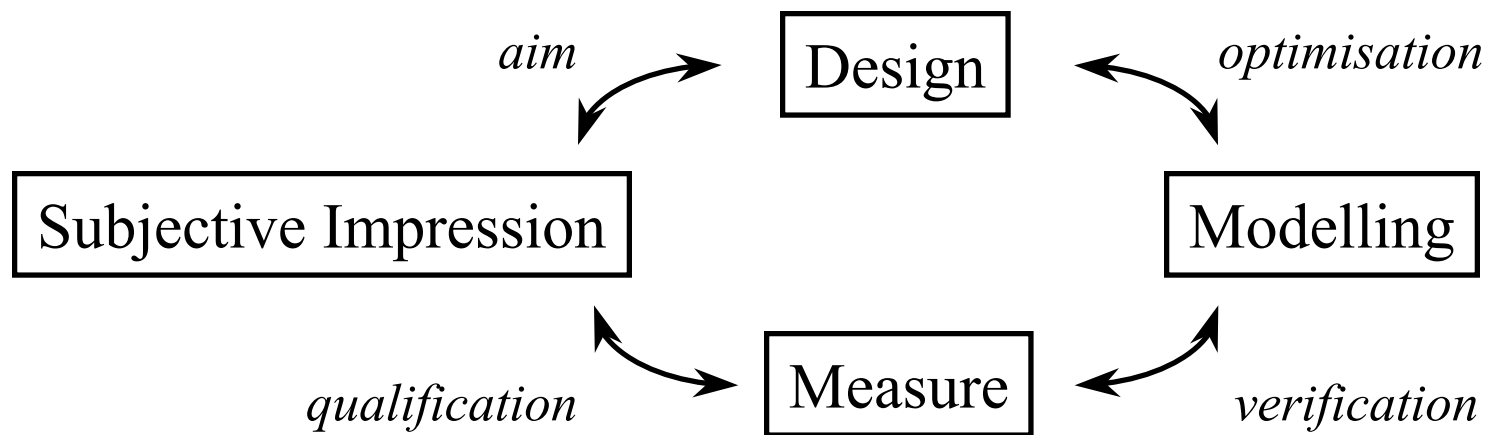


Contents

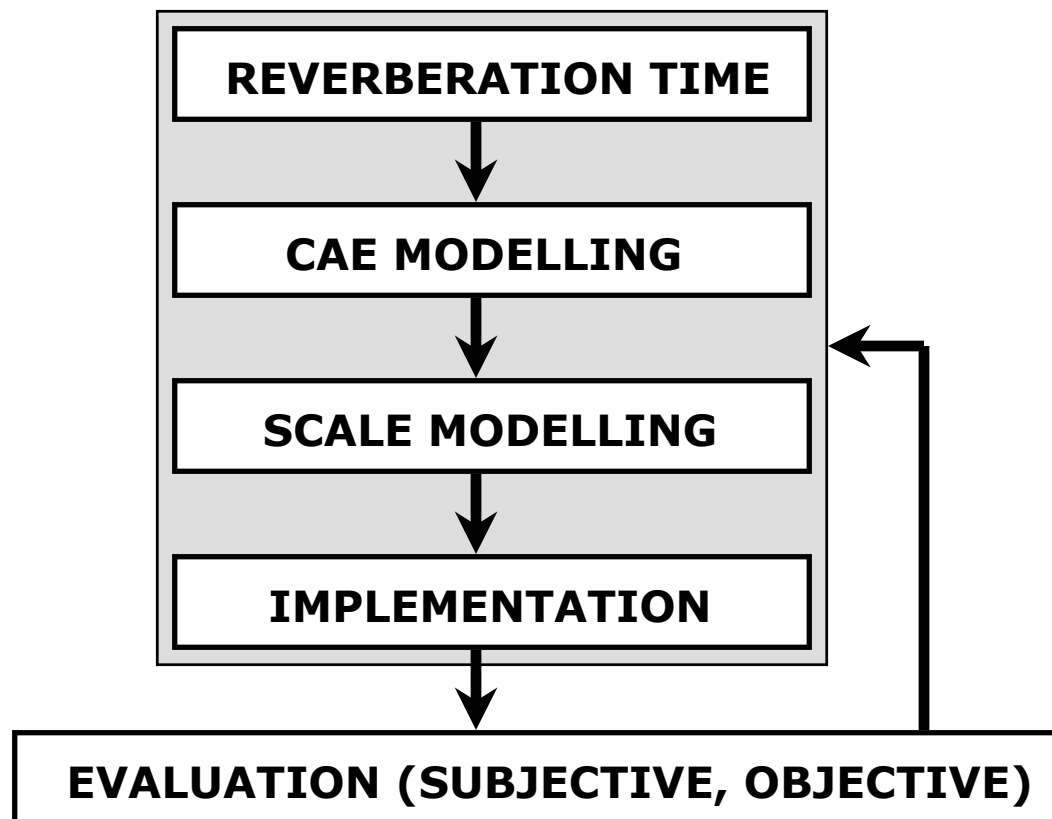
- ▣ Introduction
- ▣ The Conventional Method
- ▣ Modelling
- ▣ The Inverse Method
- ▣ Investigating Studio 6
- ▣ Conclusions

Introduction

- ▣ The “design cycle”



The Conventional Process



Modelling

- ▣ Statistical (Sabine, Eyring, etc.)
 - very coarse approximation
 - only for diffuse, reverberant fields
 - very easy to calculate

- ▣ Numerical (FEM, BEM, FDM, etc.)
 - accurate, but
 - practical only at low frequencies

- ▣ Geometrical (ray/beam-tracing)
 - limited to relatively high frequencies
 - easy to use and implement
 - transient analysis

Geometrical Modelling in Practice

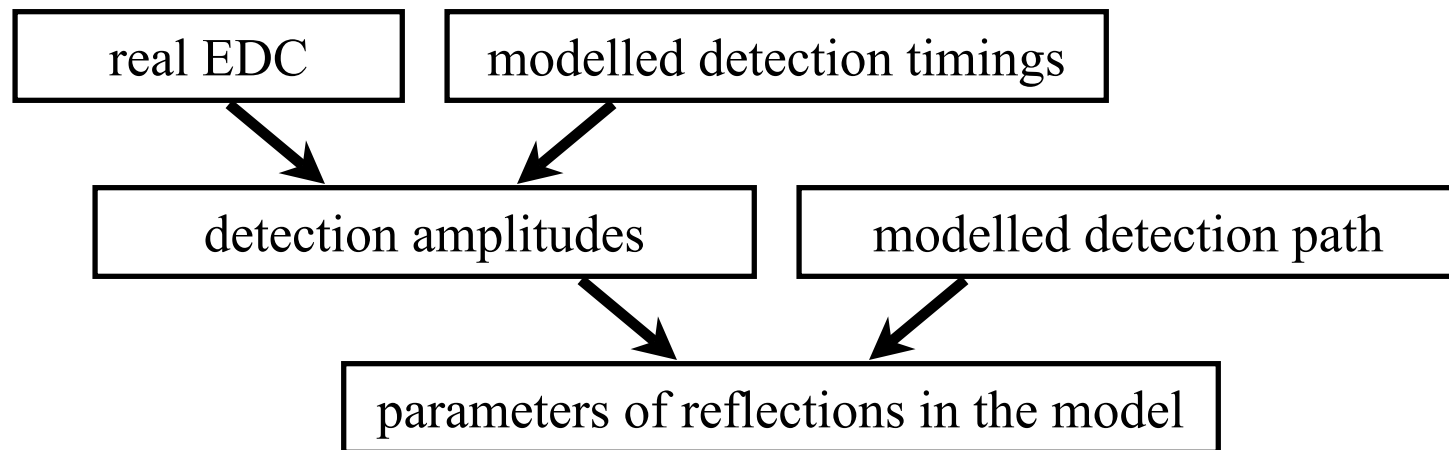
- ▣ Real sound sources
 - real sources are not point-, line- or plane-like

- ▣ Non-specular phenomena
 - diffuse reflection (SD, DS, DD reflections)
 - diffraction

- ▣ Modelling parameters
 - measurement ?
 - implementation ?

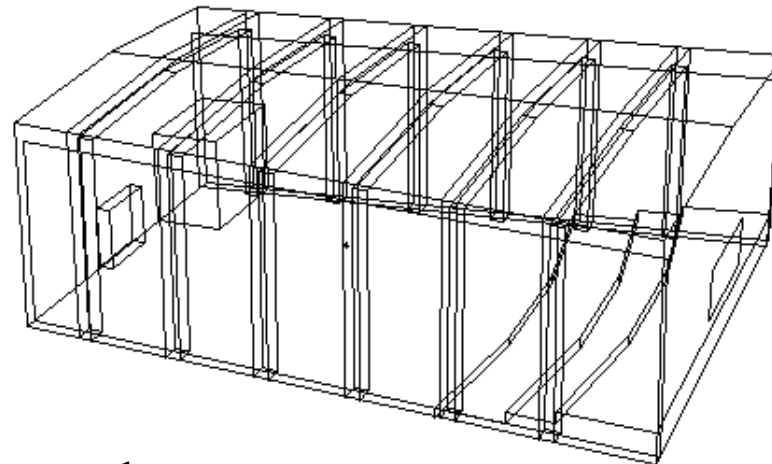
The Inverse Method

- ▣ The ideal designing process
subjective quality → objective quality → parameters
- ▣ Matching measurement and modelling: EDC Fitting

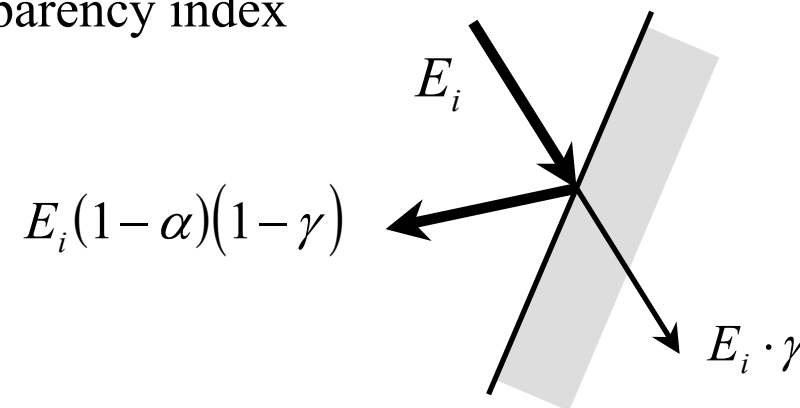


Modelling Studio 6

- ▣ The geometry

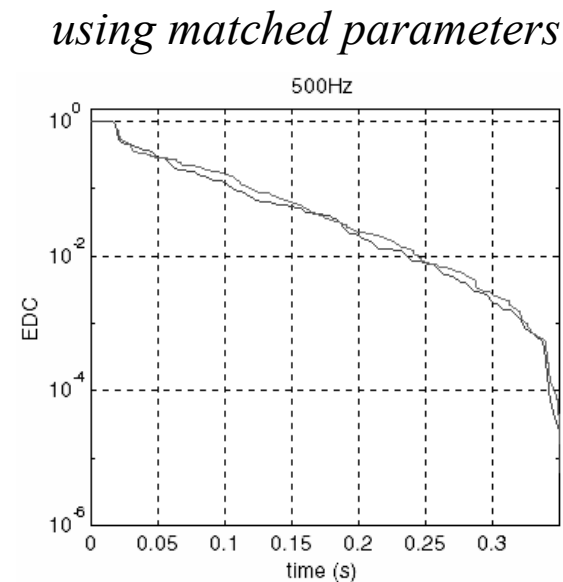
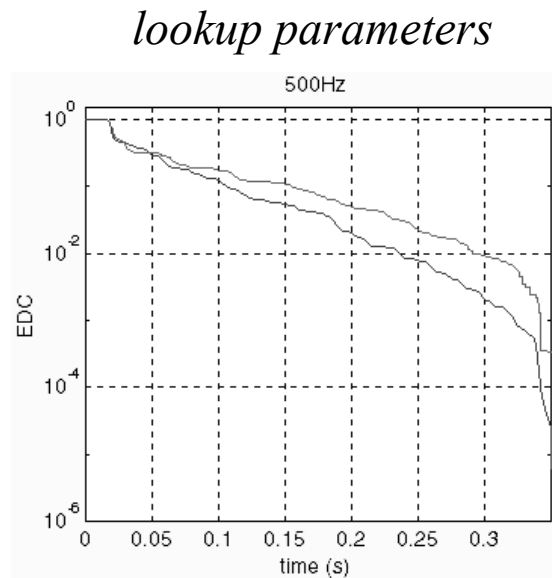


- ▣ Modelling the wall board structure
- introducing transparency index



Application of the Inverse Method

- Comparison of measured and modelled EDC



- effect of furniture is more emphasized than assumed
- absorption of wallboard is higher than expected

Conclusions

- ❑ There are weaknesses in the conventional process
- ❑ The inverse approach is a powerful and promising new tool for:
 - designing
 - measurement
 - development
- ❑ Further research is needed in the application of the method
- ❑ Further investigations are needed to specify the most important objective parameters to design for.