POLITECNICO DI TORINO
FIRST SCHOOL OF ARCHITECTURE
Master of Science in Architecture Construction City
Honors theses

Researches on acoustic of medieval churches: theoretical models and experimental applications

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The aim of the thesis has been to investigate the typical characteristic acoustics of a medieval church, which is the San Domenico di Chieri (Turin), from its foundation to the present day in order to evaluate, improve or correct it with additional elements.

The use of acoustic software implemented in recent years the study of characteristics and acoustic environments' parameters, such as churches.

This ensured a greater precision in the formulation of the data in relation to the computing power and in relation to the number of rays launched by the user.

Through the use of software like Odeon 11, has been possible to analyse earlier models of churchs and models with additional elements.
The renewed role of the spoken word, due to the reforms introduced by the Second Vatican Council (1963), has led to the need for intelligibility of the "good word", a condition which must be taken into account from the very beginning of the design, with a direct contact between the officiating clergy and the faithful and a system of routes that facilitate prayer.

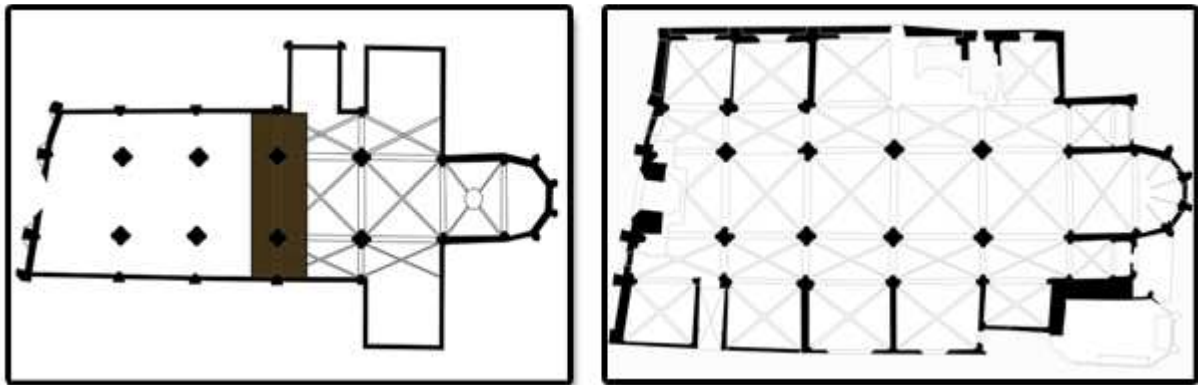
From these elements have been studied experimental solutions that improve certain acoustic parameters near the faithful, and consequently a better distribution of energy in the area congregational.

The different simulations showed significant differences from the acoustic point of view, but also architectural and liturgical between:

1. the model of a basilica "*ad aula*", with three naves covered by wooden ceiling in the nave and vaulted ceiling in the area where residence of the clergy;

2. later models with the addition of side chapels and decorations along the course of the centuries, typical of Renaissance and Baroque period, with the addition of curtains, carpets and kneeler.

On this basis, it was found that the medieval church presents acoustic parameters far from the optimum, due to the largest number of obstacles encountered by the sound on its way, more reflective materials and the total or almost total absence of decoration.



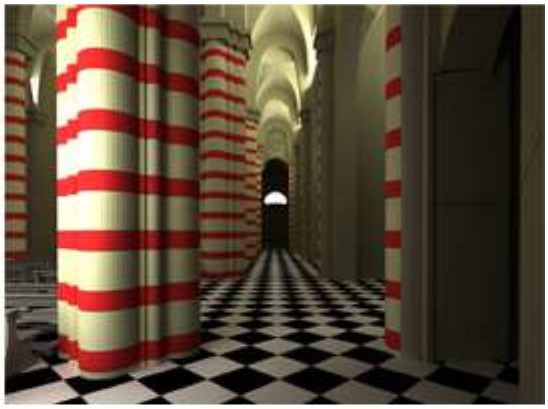
From left to right: plant medieval church three naves (1388), a plant of the church today

Conclusions:

-use of additional liturgical furnishings such as kneeler, curtains and carpets has minimized the difference between the condition of the church that occupied and unoccupied;

-the greater absorption at low frequencies, due to the wooden ceiling in the medieval church has led to a noticeable reduction of the reverberation time (T30) and sound level (G);

-clarity of sound showed a reduction in the area of the nave of the medieval church to the presence of the separation of wood (rood screen) that was going to divide the area reserved for the officiating clergy and the area reserved for the faithful. Clarity, however, has resulted in greater uniformity in the area occupied by the faithful, as opposed to the church today.

From top left: modern church with pews, curtains and carpets; church today: aisle; medieval church: nave rood screen; medieval church: aisle

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