## **Active Structural Acoustic Feedback Control**

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In Active Structural Acoustic Control (ASAC), the noise produced by shell like structures is attenuated



with structural actuators such as surface-bonded piezoelectric patches (see Figure 1). Furthermore sensors are used that measure structural vibration. If a disturbance acting on the structure, such as an incident sound field, is unknown and broad band in frequency, feedback control strategies can be applied to obtain sound reduction.

Figure 1: Transmission loss with feedback control.

## **Numerical Modelling**

A numerical tool has been developed to evaluate the structural and acoustic response when feedback control is applied. The structure and piezoelectric patches are modelled with the Finite Element Method (FEM). Model reduction techniques are applied to reduce the number of degrees of freedom. Hence the performance of several control strategies can be evaluated with small computational effort.



Figure 2: Numerical tool.

## **Experimental Validation**

The experimental setup consists of a clamped rectangular aluminium plate with two piezoelectric patches (see Figure 3). One patch is used to excite the plate (*disturbance patch*). The second patch (*control patch*, actuator) is part of a control system in combination with an accelerometer (sensor). The controller is designed to damp the structural vibration, consequently leading to a reduction of radiated sound.



Figure 3: Experimental setup.

The acoustic response is monitored with a microphone placed in front of the plate. Figure 4 compares the predicted and measured pressure levels, without control (*passive*) and with control (*active*). The results show a significant reduction of the acoustic response near the resonance frequencies, and furthermore show a good correspondence between model and measurement.



Figure 4: Predicted and measured acoustic response.

## Conclusions

- Noise produced by shell like structures can be attenuated with structural vibration reduction.
- A numerical tool has been developed and validated for controller design in active structural acoustic control.

