Université catholique de Louvain UCL SECTEUR DES SCIENCES ET TECHNOLOGIES

INSTITUTE OF MECHANICS, MATERIALS AND CIVIL ENGINEERING

Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en Sciences de l'Ingénieur

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Master ingénieur civil mécanicien - Master en musicologie

Analysing the design evolution of late 18th century *Prellzungenmechaniken* An experiment-based multibody approach applied to early piano actions

The modern piano is known as a standardised instrument, built almost exactly the same way all over the world. However, during the 18th and part of the 19th century, when some major pieces of today's repertoire were written, important differences in the design existed according to the geographic origin of the instruments. One of the earliest national schools of piano making, equipped with the so-called *Prellzungenmechaniken* (PZM), appeared in the second half of the 18th century in the regions of Vienna and southern Germany. The PZM is a mechanism (or piano action) which transmits the motion of the finger from the key to the string. Roughly speaking, the PZM can be divided in two types of schools. The first type, called 'German' actions, are attributed to Johann Andreas Stein, while the later 'Viennese' actions, a modification of the German actions, were devised by Anton Walter. The fact that the two types co-existed is a good indication that both designs had their own advantages.
This thesis focusses on the study of these two actions which were historically speaking of the greatest importance. One of the most significant differences between the two actions lies in a part called the 'pawl'. The pawl is responsible for the propulsion of the hammer and has a slightly different shape in the German and Viennese PZM. This work compares both designs and attempts to explain why Walter changed Stein's traditional pawl disposition. To this end, a piano action with interchangeable pawls has been conceived.
An important fact to consider when studying piano actions is that these mechanisms are highly dynamic systems for which a quasi-static observation cannot reveal their behaviour when they are used under normal playing conditions. High-speed imaging of the actions revealed part of their true functioning, but was unable to provide the interacting forces between parts of the mechanism. We believe that these forces are of prime importance for the identification of the advantages of each type of action. Consequently, a multibody model of the two types of PZM has been conceived so as to compute the desired data. Special care has been taken to incorporate and to refine the following features in the model: constitutive laws of the leather and the cloth, detection of the subsequent intermittent contacts, a flexible hammer shank and a vibrating string. The results of the multibody model, coupled with experiments on the real actions, support the theory that the Walter actions were probably devised to work under heavier conditions than Stein ones.

Mardi 4 octobre 2016 à 17h00

Auditoire BARB 91
Place Sainte Barbe, 1
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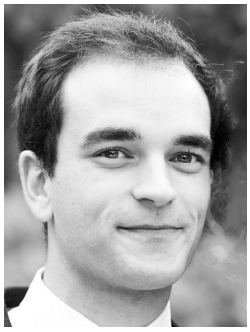

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