Proposal for Master's thesis in Applied mechanics

Human finger subjected to shock vibration loading – simulation, calibration and model validation

Background and motivation: A major concern for work health is nerve injury related to vibrating hand-held machinery. By estimation, 350 000 workers in Sweden use vibrating hand-held tools for at least 2 hours every day. It has been estimated that 11% of all female work-related diseases are attributed to vibration exposure, and 35% for men, making it the leading cause of work-related disease for men (not all to shock vibration loading though). One of the main problems is that current regulation on hand-held tools does not properly cover exposure for repeated chocks, as they have been regarded as minor in terms of transferred mechanical energy.

Therefore, there is a need to further develop, calibrate and validate simulation models that can describe wave propagation in a human finger in order to determine the relation between surface vibration and cell-level exposure. As part of ongoing work at RISE, a test rig has been developed for collection of experimental data that has been used for model development. This data can be used for further development of mathematical models that in turn can give suggestions if, and if so, what type of additional data is needed.

Project description:

- Calibrate an already existing 2D FE-model of a human finger from experimental data
- Establish a semi-analytical 1D model of a human finger for qualitative analysis of wave propagation in finger
- Suggest and carry out additional experiments in collaboration with RISE

Student background: This project is suitable for (preferably two) students with an interest in computational mechanics.

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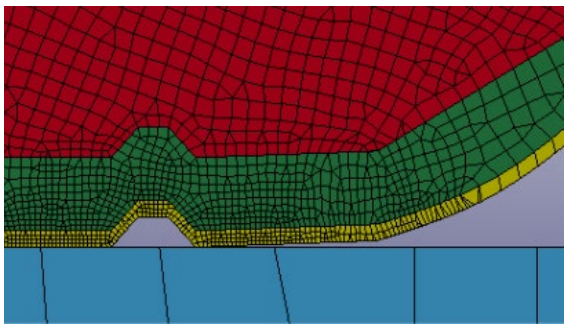	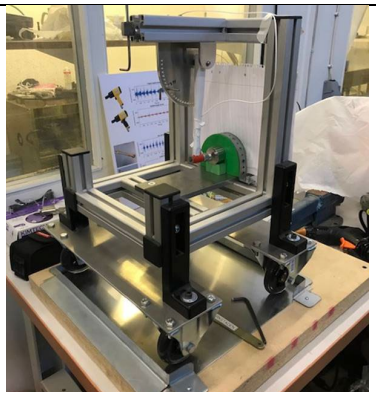
FE-model of finger	Experimental device