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EXISTENTIAL MUSINGS IN COMPUTATIONAL MECHANICS

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Abstract. Computational mechanics has seen tremendous advances in the last 40 years. Besides traditional experiments and simple analysis, it has become a third pillar throughout the engineering design and analysis process. Nevertheless, it is never a mistake to question the current state of the art and see what could and should be improved, and how competitors are evolving. The talk will summarize the main worldwide efforts in the field of computational mechanics during the last 40 years, and then explore the "existential questions" facing this field today. These include: Given recent advances in experimental techniques and fast prototyping via 3-D printing: is computational mechanics still competitive ? Are there fields where computational mechanics is not predictive, i.e. where it has not been able to provide reliable answers ? Is too much effort devoted to achieving top speeds on ever more complex HPC systems versus development of better physics models ? What are the inherent limits of high order methods ? What are the inherent limits of reduction methods such as Proper Orthogonal Decomposition (POD) and Proper Generalized Decomposition (PGD) ? Are we "thinning out at the High Performance Computer (HPC)" top end, i.e. are we facing a situation where less and less codes, and hence less and less users can achieve top speeds on HPC systems ? Which current and foreseeable hardware barriers need to be broken in order to increase fidelity and predictability in computational mechanics ? Is the current academic environment promoting the talent required to move computational mechanics to the next level ? Is the current government funding emphasis conducive to increased understanding and modeling ?