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Peculiarities of vibration assisted surface finishing methods for brittle material surfaces

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Employment of new materials, into existing production processes, commonly challenges the suitability of existing machining methods by imposing new conditions in order to maintain machinability, or preserve the integrity of the material in question. This case is most prominent when finishing surfaces of hard-brittle materials, like glass, ceramics, alloys, metals etc. Main limits imposed on conventional machining processes, concern the scale of machining, as it must be low enough to maintain ductile regime deformation. The main challenges in this case are, the necessity of real time, seamless monitoring and analysis of performance metrics of the process and the need for increasing ductile regime machining limit or brittle-ductile transition. Presented in the poster are findings of recent glass, and PZT ceramic vibration assisted drilling and binderless tungsten carbide vibration assisted side grinding experiments, performed by the Kaunas University of Technology Institute of Mechatronics and in cooperation with Fraunhofer Institute of Production Technology. Effect of vibration on brittle-ductile transition is discussed and current modelling efforts are presented. Wireless, self-charging sensors, developed by Institute of Mechatronics are proposed as a monitoring solution for the real time, seamless monitoring and analysis of performance metrics problem. Potential application benefits of wireless, self-charging sensors and their integration into cloud manufacturing systems, for machining of hard-brittle materials, are introduced.

Biography

Gytautas Balevičius is a Mechanical Engineering PhD student at Kaunas University of Technology, Institute of Mechatronics. The main focus of his doctoral thesis is - brittle-ductile transition of brittle materials during vibration assisted machining.

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