Title: Active control of an AMBs supported spindle for chatter suppression in milling process

Abstract: In machining process, chatter is an unstable dynamic phenomenon which causes overcut and quick tool wear, etc. To avoid chatter, traditional methods aim to optimize machining parameters. But they have inherent disadvantage in gaining highly efficient machining. Active Magnetic Bearing (AMB) is a promising technology for machining on account of low wear and friction, low maintenance cost, and long operating life. The control currents applied to AMBs allow not only to stabilize the supported spindle, but also to actively suppress chatter in milling progress. In this talk, we discuss an integrated control scheme for stability of milling process with a spindle supported by AMBs. First, to eliminate the vibration of an unloaded spindle rotor during acceleration/deceleration, we present an optimal controller with proper compensation for speed variation. Next, the controller is further enhanced by adding an adaptive algorithm based on Fourier series analysis to actively suppress chatter in milling process. Finally, numerical simulations show that the stability lobe diagram (SLD) boundary can be significantly expanded. Also, a practical issue of constraints on controller output is discussed.