



Using Machine Learning to Identify Machining Parameters in CNC Milling

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Abstract:

The ability to autonomously perform real time identification of the material being machined can act as a safety check for operators. This can alert an inexperienced user or chaotic manufacturing plant if a toolpath is being performed that is inappropriate for the material being cut. This built-in safety check can provide quality control and lower the barrier to entry for CNC manufacturing in Makerspaces. Researchers have used advanced sensors and machine learning in manufacturing to provide insight into tool behavior or material properties. These approaches are limited to specific tool paths and require external sensors to be mounted to the machine. However, real world machining encompasses a wide range of different tool paths with varying machining parameters, and external sensors add an unwanted level of cost and complexity to a machine. This study demonstrates that built-in sensors on a CNC mill can be used to detect and identify characteristics of the raw material being machined for a range of tool paths and machining parameters. Spindle power and load sensor data were extracted and used to train different machine learning algorithms to estimate material properties and machining parameters.