Cognitive Drilling Machine in the era of Industry 4.0: A Machine that senses material and determines spindle RPM and maintains that for machining

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Abstract:

Though cognitive machine tools concept is not new, there are not many machine tools which are built to be cognitive. Emerging technologies such as machine learning and machine vision when combined and commissioned properly will throw light on the cognitive machine tools. This work aims to develop a cognitive drilling machine by utilising already existing drilling machine, Variable Frequency Drive (VFD), microcomputer, and a camera. This is capable of sensing the material and determining the spindle speed by itself automatically. An algorithm for determining the spindle speed is developed and deployed. VFD is used to run the spindle at the determined speed. The machine tool proposed in the work is cost effective and even small-scale industries can afford it. This type of machines when installed in the production floor, will bring life to industry 4.0. Real time experiments are conducted in an industrial environment to demonstrate how the cognitive machine tool will minimize power consumption which is one among many advantages of engaging these kind of machine tools in manufacturing industries. The results presented will strongly recommend the adaption of Artificial Intelligence (AI) in machine tools for converting the traditional manufacturing into more powerful and productive smart manufacturing.