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Fuzzy looperless tension control for hot strip rolling. (English) Zbl 1175.93126
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Summary: Metal rolling is a large-scale complex manufacturing process. Tension control in such a process plays an important role for assuring both high product quality and safe process operation. Although there have been many looper control technologies developed for finishing rolling processes, looperless interstand tension control of roughing and intermediate rolling mills has had much less progress because of complex tension dynamics and multiple stand interactions. Currently, human operators are still employed in many rolling mills to manually suppress looperless interstand tensions. Having recognized the complexity of the process and the effectiveness of human-based control, a fuzzy control method is proposed for regulating looperless interstand tension. A novel decoupling strategy is employed to handle stand interactions. The proposed fuzzy control system integrated with the decoupling strategy is implemented on a roughing rolling mill containing five rolling stands. A virtual reality-based testbed is introduced to evaluate the developed system and to experimentally compare the proposed control with the control of an experienced human operator. Test results demonstrate that the developed intelligent control is able to replace a human operator and further yield better system performance.

MSC:

[93C42](#) Fuzzy control/observation systems
[93C95](#) Application models in control theory
[90B30](#) Production models
[93A15](#) Large-scale systems

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Keywords:

[fuzzy control](#); [manufacturing process](#); [rolling mill](#); [large-scale systems](#); [looperless tension](#); [human operator](#)

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