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Introducing digital twins to agriculture

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Abstract

Digital twins are being adopted by increasingly more industries, transforming them and bringing new opportunities. Digital twins provide previously unheard levels of control over physical entities and help to manage complex systems by integrating an array of technologies. Recently, agriculture has seen several technological advancements, but it is still unclear if this community is making an effort to adopt digital twins in its operations. In this work, we employ a mixed-method approach to investigate the added-value of digital twins for agriculture. We examine the extent of digital twin adoption in agriculture, shed light on the concept and the benefits it brings, and provide an application-based roadmap for a more extended adoption. We report a literature review of digital twins in agriculture, covering years 2017-2020. We identify 28 use cases, and compare them with use cases in other disciplines. We compare reported benefits, service categories, and technology readiness levels to assess the level of digital twin adoption in agriculture. We distill the digital twin characteristics that can provide added-value to agriculture from the examined digital twin applications in agriculture and in other disciplines. Then, inspired by digital twin applications in other disciplines, we propose a roadmap for digital twins in agriculture, consisting of examples of growing complexity. We conclude this paper by identifying the distinctive characteristics of agricultural digital twins.

Keywords: digital twin, agriculture, digital twin adoption, agricultural technology, technology readiness leve

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