Exploring the adoption of UX-driven approaches to design industrial PLC user interfaces

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Abstract. Modern automated production systems (e.g., automatic machines, assembly lines, robotic cells) are typically governed by dedicated industrial controllers, such as Programmable Logic Controllers (PLCs), which supervise and coordinate the process by exchanging I/O data, sequencing tasks or triggering actions with the involved automation modules. Different solutions have been developed to offer an intuitive Human-Machine Interface (HMI) programming to the user, based on PLC HMI editors, according to vendor-specific programming languages. However, in the current industrial practice, user interfaces (UIs) are usually generated by software specialists and far from adopting any user-centered approach. As a result, the generated UIs are poorly usable and hard to understand for end users (e.g., operators), diverging from Industry 5.0 ideas that put humans at the center of the modern factory design. In this context, the present paper aims at exploring how the adoption of User eXperience (UX) driven approaches can benefit the design of industrial PLC UIs, reflecting on advantages and limits, and transdisciplinary perspectives. A case study utilizing Beckhoff TwinCAT as PLC environment and Adobe XD as UX design tool is examined and discussed.

Keywords. User experience, User-centered design, Human-machine interface, User interface, Programmable Logic Controllers.

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