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| Sommario/riassunto | Long description: In this thesis, a novel sensor network paradigm is proposed and studied, inspired by the fusion of wireless communication, localization and imaging. Wireless sensor networks will open a fascinating world of ubiquitous and seamless connectivity not only between individuals but also between devices and objects in our daily life. The key to this vision is a universal low-power, low-complexity and low-cost transceiver unit that provides scalable data communication as well as location and environmental information. Ultra-Wideband (UWB) technology with its rich design space can meet the challenging requirements of future wireless sensor networks. This is the consequence of a paradigm shift compared to narrowband communication: due to the huge bandwidth available, we can trade off bandwidth efficiency against other figures of merit. The major design criterion is not data rate anymore, but rather power consumption and hardware complexity. Within the group of hardware-aware system designs, UWB impulse radio with energy detection receivers are of particular relevance and well known for their efficient implementation. The contribution of this thesis is the comprehensive study of sensor networks with generalized energy detection receivers, where we focus on innovative and efficient approaches for communication and localization and their synergy. |