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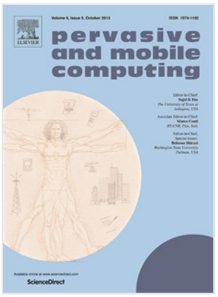

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Impact of Capacity and Discharging Rate on Battery Life Time: A Stochastic Model to Support Mobile Device Autonomy Planning

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Abstract

Mobile computing devices have improved substantially. Such a development fosters the usage of those devices for various purposes, including health care as a prominent example. Mobile health (mHealth) is a subfield of electronic health (eHealth) that refers to the practice of medicine and public health supported by mobile devices. A specific concern for mHealth is the limitation of power supply for the mobile devices, since interruptions on power supply can result in critical situations. This paper proposes analytical models to identify the mean time of one life cycle of the battery, and thus identify the average battery lifetime considering some device utilization characteristics. We evaluate the impact of both network connectivity (local and wide areas) and communication protocols (Polling, Long polling, WebSockets, and XMPP) on the discharging rate, and subsequently on the lifetime of batteries with different power capacities. We observed a noteworthy impact of these factors on battery usage and, thus, on mHealth applications. We use a hierarchical modeling approach that enables efficient representation of system complexity and provides accurate results for planning the autonomy of mobile devices in an mHealth context.

Keywords: Mobile systems, battery lifetime, network connectivity, analytical models.