Kolloquium an der FIM der Universität Passau

Am Donnerstag, den 3. November 2022 hält

Herr JProf. Dr. Philipp H. Kindt
(Technische Universität Chemnitz)

einen Vortrag über das Thema

Low Power Wireless Networks and Sustainable IoT Systems

Ort: Raum 242 (IM), Zeit: 12:00

Zusammenfassung:
With the IoT becoming a reality, an increasing number of small, wireless devices are being installed into our environment. If the ongoing trend persists, more than 1 trillion IoT devices will exist by 2040. If all of these devices are powered by batteries, more than 1.2 billion batteries will need to be recharged or replaced every day. Assuming only 50% of non-rechargeable batteries, such as coin cells, this will lead to more than 650,000 tons of disposed batteries per year. Furthermore, the energy required for manufacturing and charging these batteries corresponds to what is produced by multiple large-scale nuclear power plants. Clearly, in the way devices are designed today, the IoT will not be sustainable. It is therefore of crucial importance to make the IoT fully self-sustained and batteryless in the future. This talk presents two different directions of addressing this problem.

First, since wireless communication still drains a significant part of the entire energy budget of an IoT device, communication protocols that significantly reduce this energy consumption are needed.
IoT devices typically only participate in the wireless communication, if there are new data to be transmitted, because maintaining a synchronous connection would be too costly in terms of energy. Hence, whenever new data is ready, devices have to re-establish a connection to their remote devices. In this talk, a provably optimal protocol for such an asynchronous form of communication between a pair of mobile, wireless devices is presented. It guarantees that for a given energy-budget of every device, an initial contact to a different device is established within the lowest possible amount of time. This allows every device to reduce its energy consumption, while at the same time achieving practical communication latencies.

Second, while reducing the energy consumption of mobile IoT devices is one approach towards addressing the energy issues faced in future IoT deployments, another concept is eluding that an IoT device actually needs to be mobile and hence, battery powered. In the second part of this talk, we present an approach in which IEEE 802.11 (WiFi) radiation is used as a sensor. In particular, wireless signals are attenuated and reflected by the human body, which can be detected by a receiver. Based on this, we can e.g., estimate the number of persons present in a room. In this way, room occupancy can be sensed without deploying any mobile devices. This can be used to e.g., automatically switch off the air conditioning or heating whenever the room is empty, thereby saving significant amounts of energy. We also present different other applications of WiFi-based sensing, such as recognizing the identity of subjects sitting in front of a monitor.

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