Sapienza PhD in ICT

Doctoral program in Information and Communications Technologies at Sapienza Università di Roma, Rome, Italy

Seminar series of
Enabling Advances in Technology (EAT) @ DIET

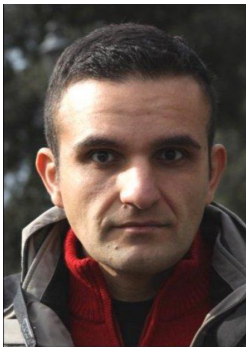
Seminar Announcement

September 17th, 2015 - DIET Dept. Room 206, 1:15 p.m.

A novel nonlinear battery model for accurate State of Charge estimation using Extended Kalman Filter

Speaker: Dr. Maurizio Paschero

Abstract: Due to the reliance of Hybrid and Plug-in Electric Vehicles on battery technologies, an accurate State of Charge (SoC) determination in Li-Ion batteries is a key aspect to the successful adoption of these innovative vehicles in every day life. Determining the exact amount of energy available in a battery, is an extremely difficult endeavour, due to the lack of deep knowledge of the electro-chemical behavior of a cell. The only available option is to perform an estimation of the SoC based on current and voltage measurements. In the literature there exits several techniques to perform this estimation: open circuit voltage (OCV) calculation, coulomb counting, and/or more sophisticated techniques that employ state estimators such as the Extended Kalman Filter (EKF). An equivalent circuit model is said to be realistic if it is able to reproduce within a given error the voltages or the current measured at the real component when it is driven by any current or voltage waveform. The accuracy depends strongly on the choice of the foundational circuit elements. In fact, trying to model a non-linear device through linear components implies the introduction of mathematical artifices, as SoC dependent resistors, that do not reflect any physical component. In the present research, each cell has been modelled as a nonlinear two terminal device. The voltage measured at the cell terminals has been modelled by three main contributions: a quasi-stationary, a dynamic, and an instantaneous component. It is important to note that each of these contributions has a different time scale.This new paradigm helps to introduce an more accurate parameters identification resulting in a more accurate r estimation of the state of charge of the battery.



Bio: Maurizio Paschero is a post doctoral research associate at the Information Engineering, Electronics and Telecommunications Department of the University of Rome ”La Sapienza” since September 2008, where he works in the Polo per la Mobilità Sostenibile (POMOS) Laboratories. He received his M.S in Electronic Engineering 2003 and the Ph.D in Information and Communication Engineering in 2006 from the University ”La Sapienza” of Rome and the Ph.D in Mechanical Engineering in 2008 from Virginia Polytechnic Institute and State University. His major fields of interest include the Smart Grids, circuital modeling of multi-physic systems, intelligent signal processing, control of hybrid powertrain, smart structure, stability of structure. He is author or coauthor or more than 30 scientific publications on international journals and conferences.