



TRANSPORTATION TECHNOLOGIES AND INTELLIGENT AUTOMOTIVE SYSTEMS
APPLICATION AND RESEARCH CENTER



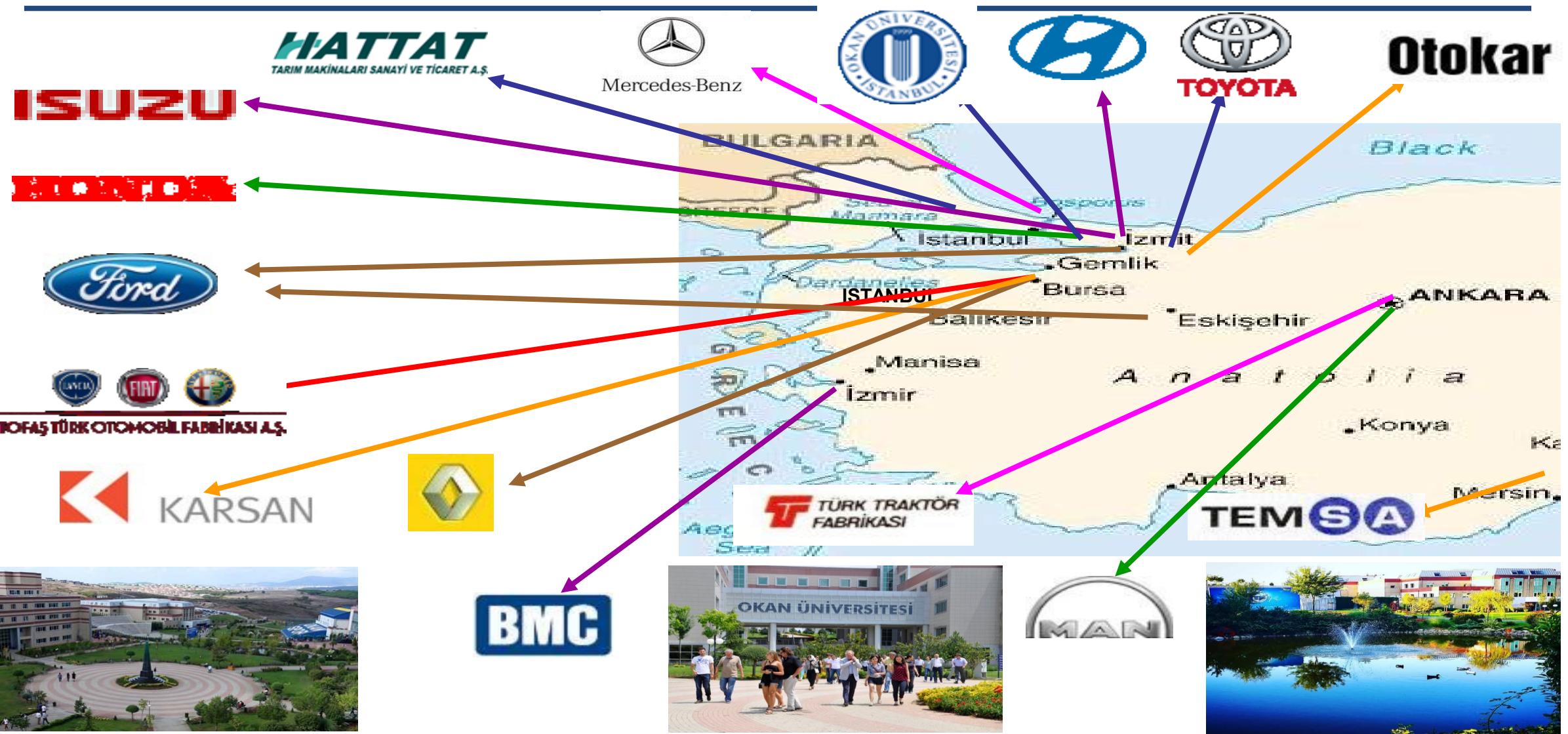
— İSTANBUL —
OKAN ÜNİVERSİTESİ

Okan University

Transportation Technologies & Intelligent Automotive Systems R&D Center

Prof. Dr. R. Nejat TUNCAY

Location of İstanbul Okan University



- The **TTIS**, Transportation Technologies and Intelligent Automotive Systems R&D Center, founded in 2009.
- **TTIS** aims to be a World Wide recognized a Centre of Excellence in the field of Intelligent & Clean Transport Systems.
- First fully autonomous car developed in Turkey in 2010.



- Innovative and Sustainable Electrical and Hybrid Vehicle Technology Development & Clustering Center established in 2014, with ISTKA support



- Innovative, Intelligent and Communicated Vehicle Technology Development & Clustering Center founded in 2015





TTIS is only university member of **ERTICO**, European Intelligent Transport Network from Turkey.



TTIS is only university member of **EGVIA** from Turkey.



Member of **OTEP** Automotive Technologies Platform in Turkey.

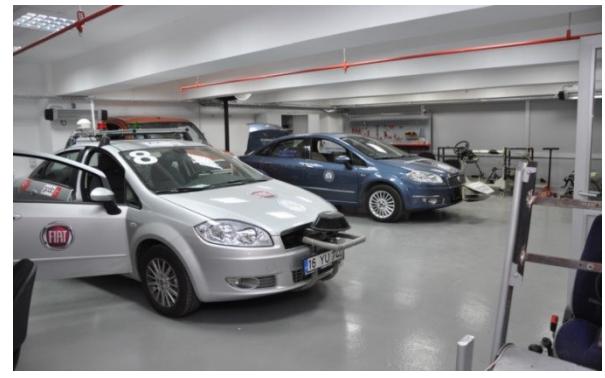
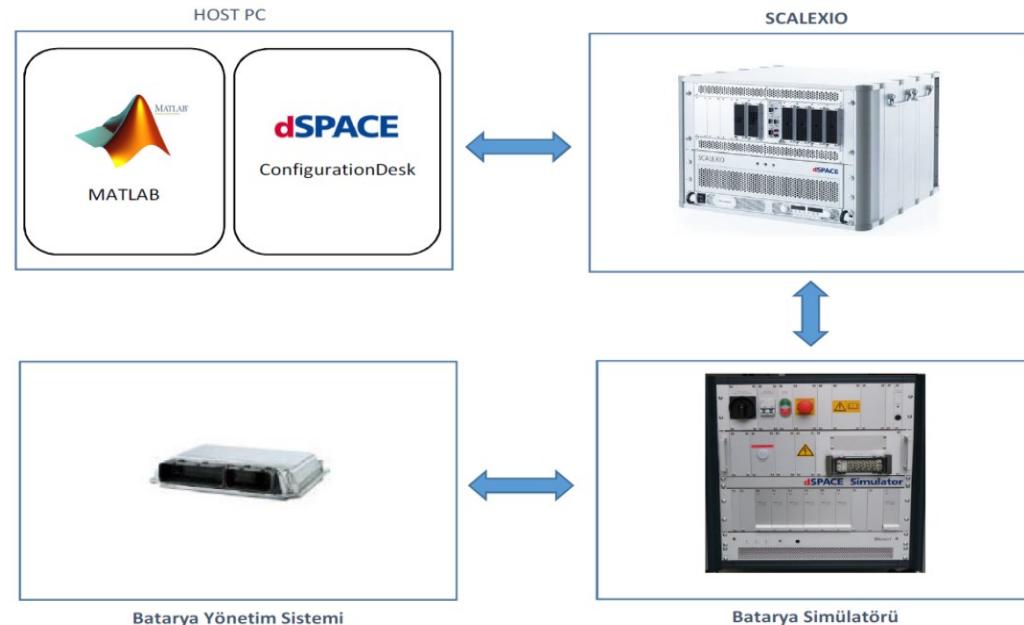


Member of **AUSDER**, Intelligent Transport Association

Engineering Faculty Laboratories Affiliates with TTIS

- Automotive Prototype Research Lab.
- dSPACE Battery Emulator System Lab. for testing BMS.
- MIL-SIL-HIL Systems Lab.
- Autonomous Vehicle Sensors & Design Lab.
- Power Electronics & Energy Conversion Lab.
- Advanced Electronics, DSP and Communications Lab.
- Mechatronics & Sensors Lab.
- Computer Aided Design Lab.
- Software Development & Game Design Lab.
- Heat Flow Testing Lab.
- 150 kW Electrical Machine Testing Lab. for Electric Vehicles.

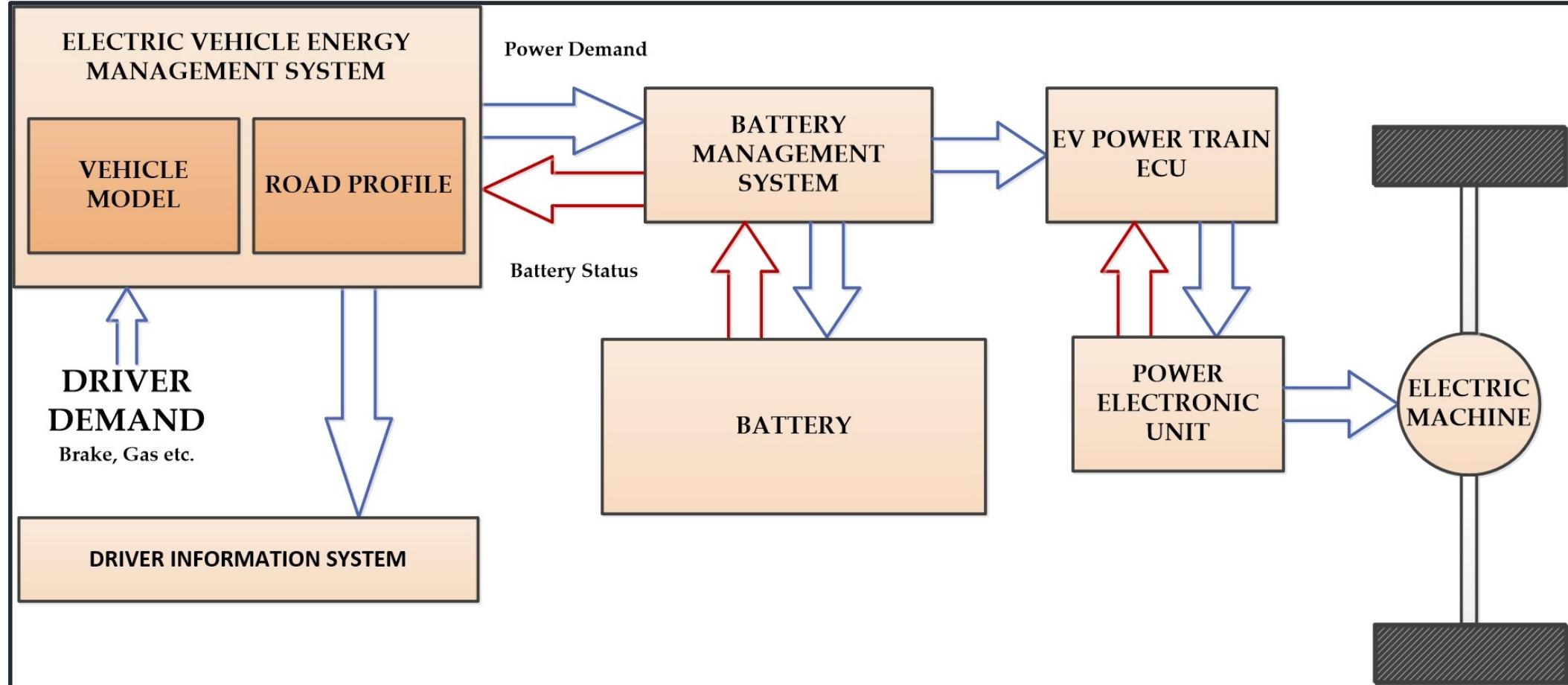
Engineering Faculty Laboratories Affiliates with TTIS



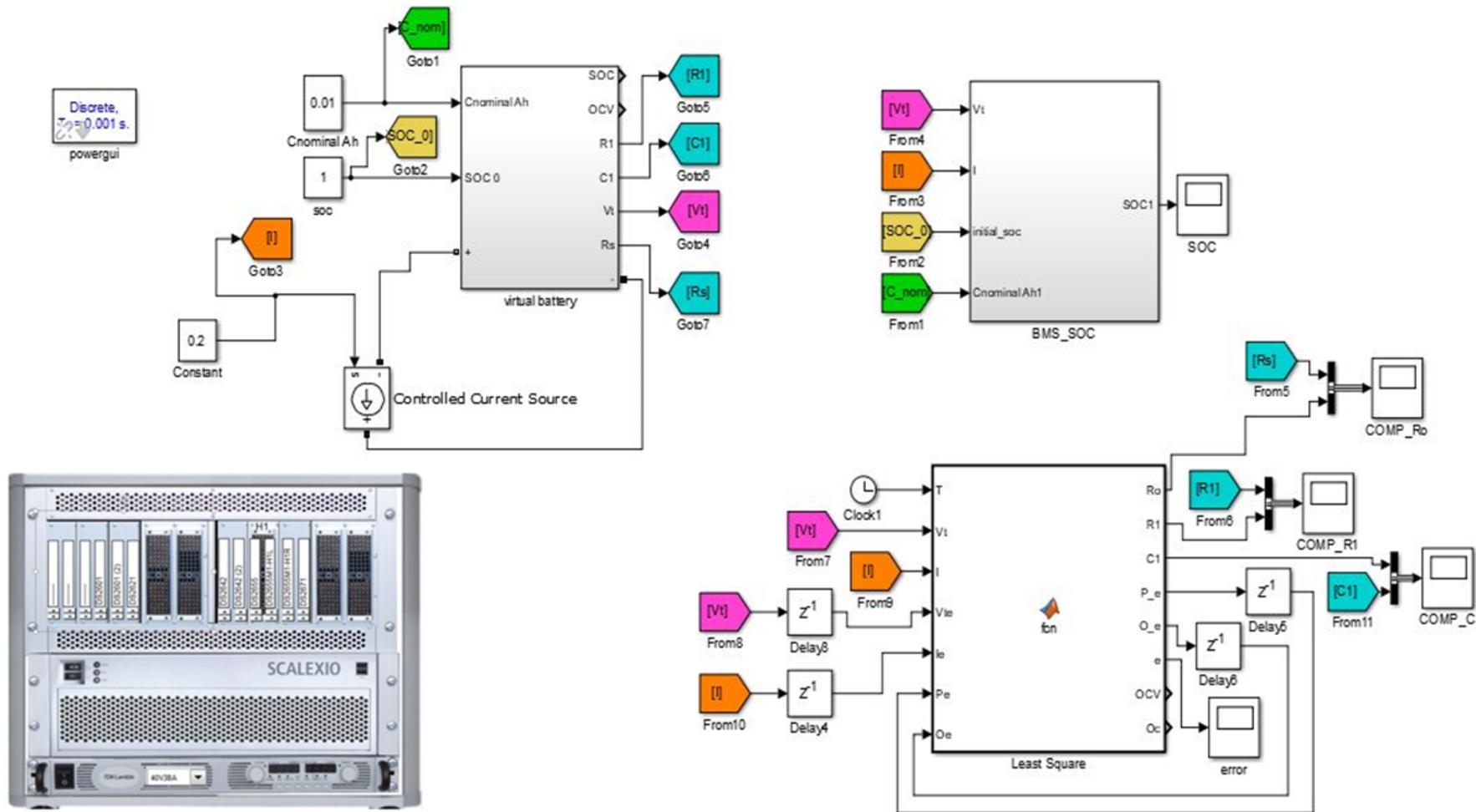
Recent Projects

- **OPINA “Open Innovation Autonomous Vehicle Development Development and Testing platform”**, IPA II, EU Project, Prof. Dr. Semih Bilgen, Prof. Dr. Orhan Alankuş, (2018-2022)
- **İleri Seviyede Otonom Otobüs Sistemi Geliştirmesi** Teydeb 1505, Proje No: 5170067, Prof. Dr. Orhan Alankuş (2018-2020)
- **OptiTruck “Optimal Fuel Consumption with Predictive PowerTrain Control and Calibration for Intelligent Truck”**, H2020-GV6-2015, Prof. Dr. Orhan Alankuş (2016-2019)
- **Dinamik ve Modüler Akıllı Batarya Yönetim Sistemi ;(ARDEB 1003)**, Prof. Dr. R. Nejat Tuncay (2015-2017).
- **Yüksek Manevra Kabiliyetli, Endüstriyel ve Askeri Amaçlı İnsansız Kara Aracı Platformu Tasarımı ve Gerçeklenmesi**; ARDEB 1002, Dr. Ömer Cihan Kivanç (2016-2017).

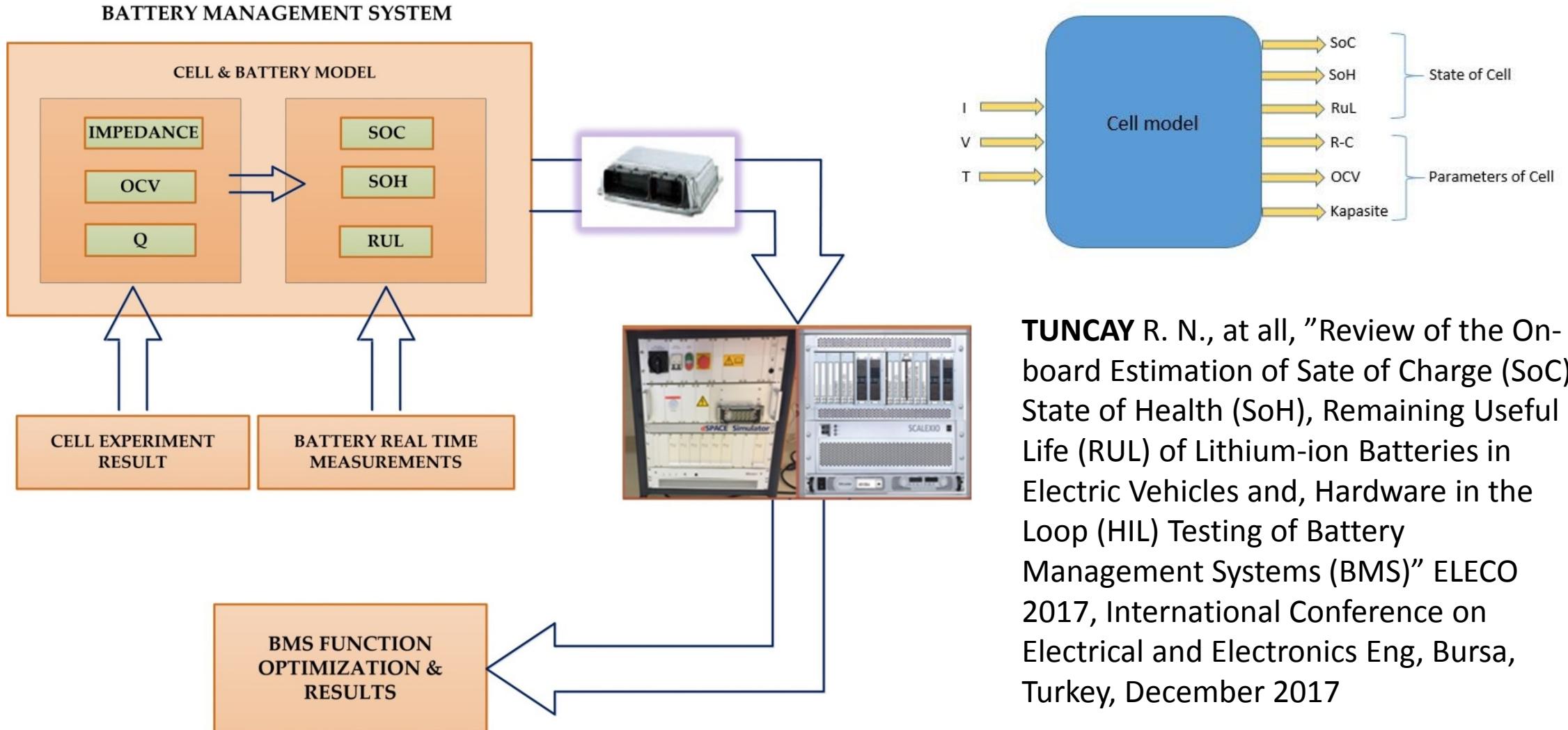
Battery Related Activities & Capabilities



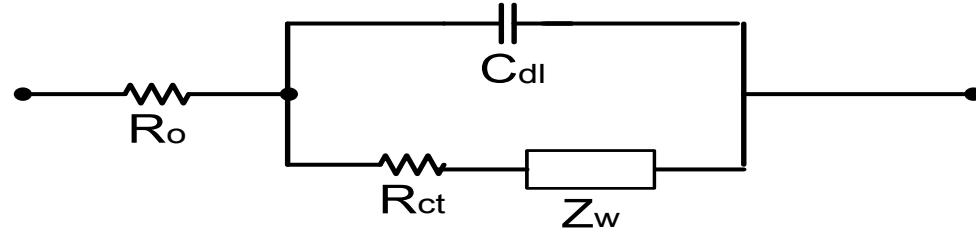
Dynamic Li cell electrical model and SOC, SOH, RUL calculation algorithms were developed and embedded in dSPACE Scalexio System



Battery Related Activities & Capabilities



Nyquist Diagram for the Randles Equivalent Circuit

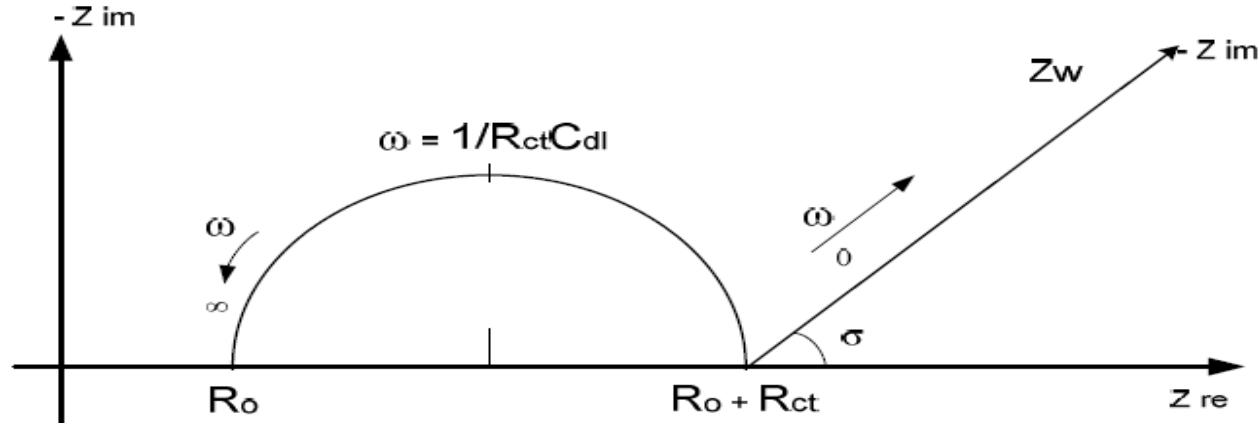


$$Z = R_o$$

$$\omega = 2\pi f$$

$$C_{dl} = X_C \cdot \omega$$

$$R_{ct} = Z - R_o$$



The semicircle in the diagram → kinetic control region
The linear part → mass transfer control region (diffusion)

R_o : Electrolyte Resistance,

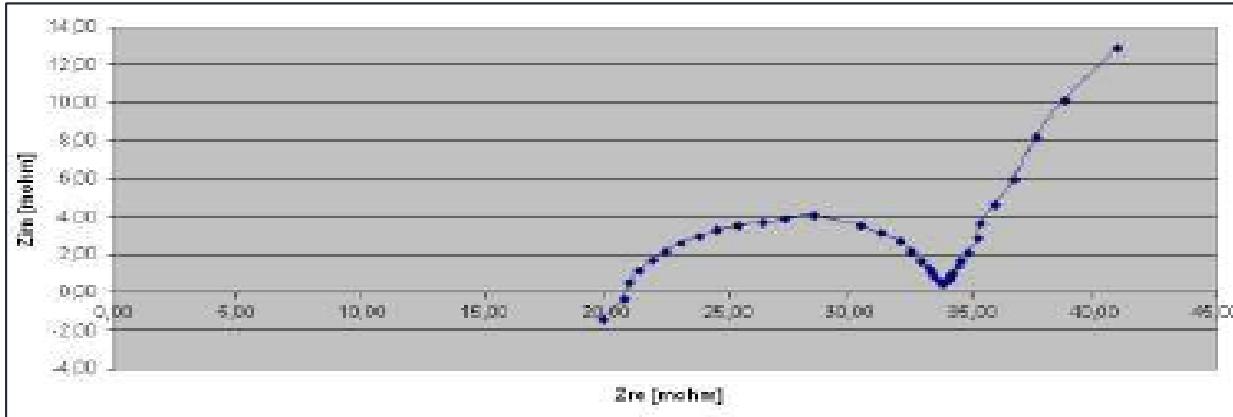
C_{dl} : Double Layer Capacity,

R_{ct} : Charge Transfer Resistance

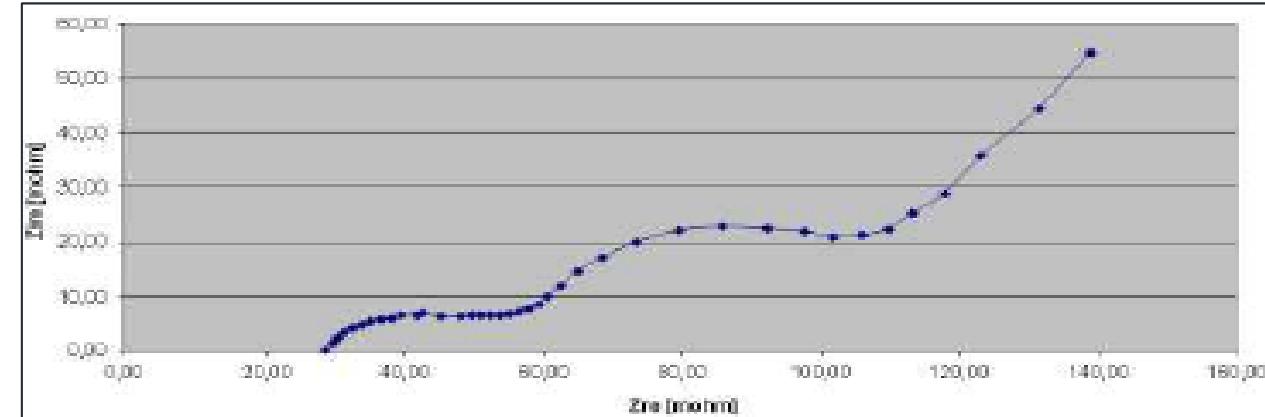
Z_w : Warburg Impedance

Battery Related Activities & Capabilities

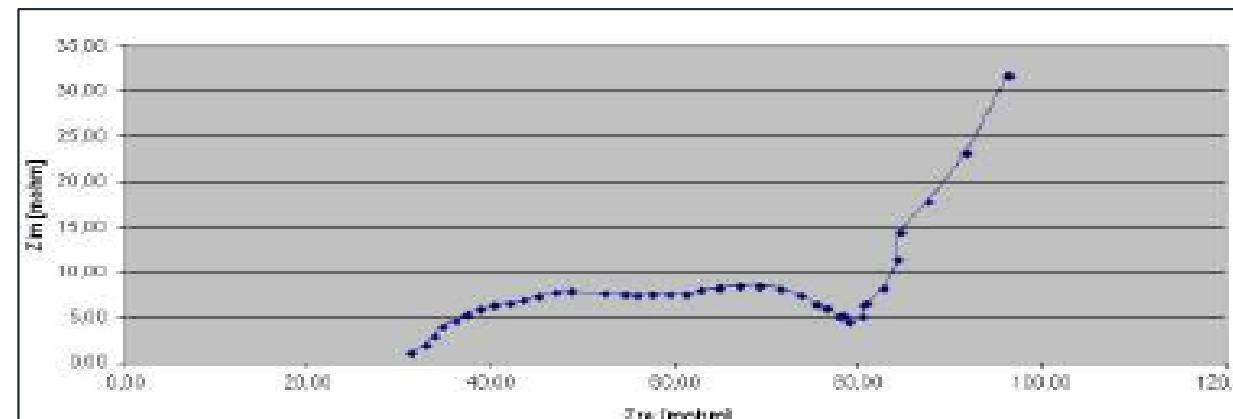
Without any overcharge



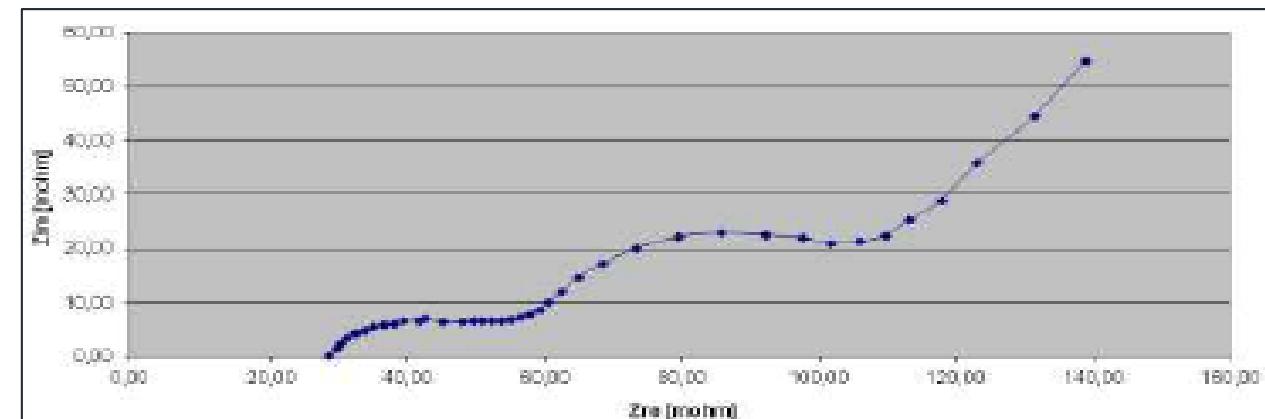
2 hours overcharge



1 hour overcharge



3 hours overcharge



KAYPMAZ C., TUNCAY R. N." An Advanced Cell Model for Diagnosing Faults in Operation of Li-ion Polymer Batteries", IEEE VPPC2011, USA

Key Research Team

R.Nejat TUNCAY, BSc. EE (Yük. Müh, ITU), PhD. University of Manchester, U.K.

Orhan ALANKUŞ, BSc. MSc. Mech., (METU), PhD. Univ. London, Imperial College, United K.

Semih BİLGEN, BSc. EE MSc.(METU), PhD. University of Manitoba, Canada.

Tevfik Akgün, BSc. EE (YTU), MSc. and PhD. Computer, Istanbul Technical University, Turkey.

Gamze Gediz İLİŞ, BSc, Mech. 9 Eylül Univ., MSc., PhD., Izmir High Tech. Institute, Turkey.

Ömer Cihan KIVANÇ, BSc. EE (ITU), PhD. Okan University, Turkey.

Barış ÖZTÜRK, BSc. EE (ITU), MSc. and PhD. University of Texas A&M, USA.

Aslı ERGÜN, BSc. Chemical (METU), MSc. and PhD. Sunum Lab, Sabancı University, Turkey.

Burak Kelleci, BSc. MSc. EE (ITU), PhD. University of Texas A&M, USA.

Contact

- nejat.tuncay@okan.edu.tr
- orhan.alankus@okan.edu.tr

Teşekkürler