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Editorial for TOK 2016 special section

Automatic Control National Meeting is an annually organized event bringing together the researchers from various universities and industry in Turkey. The 18th Automatic Control National Meeting (TOK'2016) was organized by Eskişehir Osmangazi University on 29–30 September 2016. The Turkish National Committee for Automatic Control (TOK), which supports the organization of these scientific meetings, has been a pioneer in the organization of international scientific meetings on behalf of the International Federation of Automatic Controls (IFACs), as well as these national conferences. The objective of TOK is to encourage the progress of institutional and applied systems of automatic control science and technology in all systems and to carry out joint work in this field with all national and international related institutions. TOK supports the various scientific activities in this direction in line with this aim as well as providing the approval and support to organize conferences, symposiums, workshops organized by the IFACs in our country. The current special issue contains six papers from the symposium program, which had 190 contributions.

The first paper, by Izmitligil and Ozkan, proposes an offline home energy management system to minimize electricity cost and reduce high peak demand while maintaining user comfort. The system contains uncontrollable, semi-controllable and controllable type smart electrical appliances. Other components of the system are power resources (grid, backup battery, photovoltaic system), communication network, plug-in hybrid electrical vehicle and a main controller. Main controller solves a mixed integer linear programming problem that is subject to smart and energy efficient operation constraints defined for smart electrical appliances and power resources depending on user requests, power resources and smart electrical appliances information. The solution provides cost minimizing schedules of controllable appliances and power resources. Simulation results demonstrate that the proposed system significantly reduces the electricity costs and high peak demand.

The second paper, by Bahtiyar et al., presents a discretization based sliding mode observer (DBSMO) for the state and parameter estimation of nonlinear system. An accurate discretized dynamic is derived for the state and parameter update of the sliding mode observer instead of integration-based state update. They applied conventional sliding mode observer and DBSMO separately to control a DC/DC power converter. They show that estimation performance of DBSMO is better than that of the conventional sliding mode observer, as a result the tracking performance is improved.

In the third paper, Kartal et al. develop a nonlinear mathematical model for an unmanned underwater survey vehicle (SAGA). They used Newton-Euler formulation to obtain the equations of the model. The 3D motion is realized by a suitable combination of right, left and vertical thrusters. The navigation problem is solved by using the inertial navigation system and acoustic-based measurements together. These are integrated to obtain navigation data of the vehicle more accurately. In addition, the magnetic compass and depth sensor are used in order to support attitude of the vehicle and depth information. The navigational data of the vehicle has been improved using a Kalman filter. Most of the 'important' parameters are obtained based on a system identification study of the vehicle by using this estimated navigational data for coupled motion.

In the following paper, Senturk and Patoglu present the design, control and characterization of MRI-VisAct, a low-cost, Bowden cable-actuated rotary series viscoelastic actuator that fulfills the bidirectional compatibility requirements to the maximum extend. The main body of MRI-VisAct is built using nonconductive, diamagnetic MRI compatible materials for use within the magnet room, while conventional control/signal processing units and electric actuators with ferromagnetic/paramagnetic components are placed in the control room, located outside the MRI room. Power and data transmission between MRI and control rooms are achieved through Bowden-cables and fiber optics, respectively. This arrangement ensures that neuro-imaging artifacts created under required strong magnetic fields are minimized, while safety hazards within the MRI room are eliminated, and the device performance is not affected by the magnetic field. MRI-VisAct works under closed-loop torque control to ensure safe physical interaction with patients during physical rehabilitation and assessment.

In the fifth paper, Oznalbant present the control approach and flight test studies of a vertical take-off and landing (VTOL), unmanned aerial vehicle (UAV). The aircraft studied has three flight modes: vertical flight mode, transition flight mode and conventional flight mode. The mathematical model of the aircraft is generated by placing the aerodynamic and propulsion model into the general equations of motion. After representing the trim conditions for each flight mode, the longitudinal stability characteristics are investigated. The performed flight tests with the prototype aircraft and the results of last transition flight test are discussed.

In the last paper, Adiguzel et al. design and implement an adaptive back stepping controller for a magnetic levitation system. The purpose of the controller is to derive the position tracking error of the ball to zero despite the uncertainties of the parameters and nonlinearities in the system. The adaptation rules of the controller are defined in terms of uncertain model parameters and gravitational acceleration in the system model. The authors verified the effectiveness of the proposed controller through simulations and experimental studies.

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