บทความที่น่าสนใจประจำเดือนเมษายน 2559
สาขาวิทยาศาสตร์และเทคโนโลยี

1	Title:	Precise Speed Tracking Control of a Robotic Fish Via Iterative Learning Control
	Author:	X. Li ; Q. Ren ; J. X. Xu
	Journal:	IEEE Transactions on Industrial Electronics, Volume:63 Issue:4, April 2016, pages 2221 - 2228
	Abstract:	In this paper, we present a novel work in which an iterative learning control (ILC) method is applied to a two-link Carangiform robotic fish in real time and achieves precise speed tracking performance. By virtue of the Lagrangian mechanics method, we establish a mathematical model for the robotic fish. The robotic fish model is highly nonlinear and nonaffine in control input, which hinders the applicability of most control methods that require affine-in-input. ILC is suitable because it works for such circumstances. A P-type ILC algorithm is adopted for speed tracking tasks of the robotic fish. The rigorous convergence analysis is derived based on composite energy function (CEF). In practice, the precise model of robotic fish is difficult to be obtained due to many uncertain factors. By employing ILC, the speed tracking control performance can be improved significantly without using the perfect model. Both simulations and experiments are conducted to illustrate the effectiveness of ILC, and excellent speed tracking is achieved for the robotic fish.
	Database:	IEEE/IET Electronic Library (IEL)

2	Title:	Wireless Alarm Microsystem Self-Powered by Vibration-Threshold-Triggered Energy Harvester
	Author:	Q. Tang ; Q. He ; M. Li ; C. Dong ; D. Xu ; X. Li
	Journal:	IEEE Transactions on Industrial Electronics, Volume:63 Issue:4, April 2016, pages 2447 - 2456
	Abstract:	A novel self-powered wireless sensing micro-system is proposed and prototyped. The micro-system can autonomously monitor the amplitude of concerning vibration when it reaches a preset threshold, and wirelessly transmit alarming/notification signals when the vibration lasts for a considerable period. The event-driven sensing/alarming function is enabled by a piezoelectric energy harvester that starts to generate electric power only when the monitored vibration level reaches a critical threshold. The harvester consists of two stages of vibratory structures that interact with each other via magnetic repulsion. The bistability leads to the threshold-triggered power-generating function. For adapting to various applications, the threshold can be preset by adjusting the gap-distance between the two magnets on the two vibration stages; thereby, the power-generating action can be switched on by the concerning vibration level. The working mechanism is verified by both theoretical analysis and test for the prototyped miniature harvesters. Based on the smart energy-harvesting function, an application specific electric-energy control circuit and an RF-transmitter are designed to form a nonsupply wireless

		alarming system. Experimental results validate the event-driven alarming function. The abnormal vibration event-induced wireless alarming signal is autonomously transmitted to over 2 km away when the vibratory excitation lasts for 1 min to generate electrical energy of about 2 mJ.
	Database:	IEEE/IET Electronic Library (IEL)

3	Title:	A Topology and Design Optimization Method for Wideband Piezoelectric Wind Energy Harvesters
	Author:	N. Rezaei-Hosseinabadi ; A. Tabesh ; R. Dehghani
	Journal:	IEEE Transactions on Industrial Electronics, Volume:63 Issue:4, April 2016, pages 2165 - 2173
	Abstract:	This paper presents a topology for wideband piezoelectric wind energy harvesting and a design optimization method for capturing maximum available energy considering the wind speed distribution model. The proposed device is useful for powering of wireless sensor nodes in smart monitoring applications. The device includes a piezoelectric beam that vibrates due to the interactions between miniaturized permanent magnets (PMs) embedded in a small turbine and a magnet at the tip of the beam. The design method determines the resonance frequency of the beam with respect to the wind speed distribution model. Compared to the conventional wideband topologies that include multiple beams for resonating at different frequencies, the suggested topology uses a single beam and achieves the wideband feature via the arrangement of PMs within the turbine. This feature enhances the power density of the piezoelectric wind energy harvester. The wideband feature of the device is experimentally verified using a device prototype in which the beam resonance occurs at the fan rotational speeds of 155.0, 193.5, 257.9, and 387.0 rad/s. The maximum power density, maximum efficiency, and cut-in wind speed of the device are 0.59 mW/cm^3 , 24%, and 2.1 m/s, respectively.
	Database:	IEEE/IET Electronic Library (IEL)

4	Title:	Novel Design and 3-D Printing of Nonassembly Controllable Pneumatic Robots
	Author:	Y. Wei ; Y. Chen ; Y. Yang ; Y. Li
	Journal:	IEEE/ASME Transactions on Mechatronics, Volume:21 Issue:2, April 2016, pages 649 - 659
	Abstract:	Additive manufacturing (known as 3-D printing to the public) technologies are capable of fabricating mechanical parts without the limitation of geometric complexity. If properly designed, a mechanism can also be automatically fabricated without the need of assembly. Considering these capabilities of 3-D printing, this paper presents a novel pneumatic robot design that can be fabricated by 3-D printing processes without the need of assembly. The key element of the proposed robot is the innovative design of a pneumatic stepper motor that allows control of multimotion pattern modes. The proposed pneumatic stepper design is based on a fan motor, thus, having a low requirement on airtightness, which makes it possible for 3-D printing fabrication. For angular motion control, a roller valve is added

	to the fan motor design. By controlling the air pressure of the roller valve, continuous motion and stepping motion can be obtained. Experiments have shown that the angular velocity can also be controlled by varying the roller-valve air pressure. The effectiveness of the proposed concepts has been demonstrated by a 3-D printed nonassembly pneumatic robot. The printed robot, when connected with air tubes and a pneumatic controller, can perform simple pick and place operations. It is argued that the future functional nonassembly pneumatic robotic systems could be 3-D printed for relevant industries.
Database:	IEEE/IET Electronic Library (IEL)

5	Title:	A New Physics-Based Drying Model of Thin Clothes in Air-Vented Clothes Dryers
	Author:	T. Yi ; J. C. Dye ; M. E. Shircliff ; F. Ashrafzadeh
	Journal:	IEEE/ASME Transactions on Mechatronics, Volume:21 Issue:2, April 2016, pages 872 - 878
	Abstract:	A new physics-based model for the drying process is introduced, capable of accounting for both fabric sizes and types. This is achieved by using the probability function and the latent heat of the water at a given temperature. Furthermore, the dependence of drying efficiency on various drying load sizes is discussed and a new interpretation of drying efficiency, called normalized drying efficiency, is presented. This allows coherent and meaningful comparison of the process efficiency across various load sizes and cycle times. Finally, percolation theory is introduced to explain qualitatively the effect of clothes load sizes on the drying process. This is achieved through determining the probabilities of a volume ratio (vacant volume per total drum volume), which is the probability of the interaction between the clothes loads and hot air flow in the clothes dryer. The model is validated using both experimental and literature data and is now being used for the development of an energy efficient moisture removal process, which is essential to the design of next-generation energy efficient clothes dryers.
	Database:	IEEE/IET Electronic Library (IEL)

6	Title:	Bioinspired Smell Sensor: Nostril Model and Design
	Author:	B. L. Villarreal ; J. L. Gordillo
	Journal:	IEEE/ASME Transactions on Mechatronics, Volume:21 Issue:2, April 2016, pages 912 - 921
	Abstract:	Chemical sensors are used mainly for odor discrimination and odor concentration monitoring. A recent development is the insertion of chemical sensors in mobile robots to track odor traces as well as to detect and declare odor sources. A major drawback of a chemical sensor for perceiving odors is the time it needs to recover its original state once saturated. Furthermore, when the source behaves as a constant gas leak, the presence of the odor is always increasing in the environment, saturating the sensors. The integration of chemical sensors into real-time mobile applications requires the smell

		perception system to desaturate them faster. This paper proposed an artificial nostril, inspired by nature, including the design of chambers to desaturate the sensors and the mathematical model. The main contribution is the implementation of the biologically inspired process of “ventilation” that bears in mind the sensor model as a cyclic behavior that includes three stages named inhalation, sampling, and exhalation. This model guided the design of the smelling device.
	Database:	IEEE/IET Electronic Library (IEL)

7	Title:	Eco-driving in urban traffic networks using traffic signals information
	Author:	Giovanni De Nunzio, Carlos Canudas de Wit, Philippe Moulin and Domenico Di Domenico
	Journal:	International Journal of Robust and Nonlinear Control, Volume 26, Issue 6, April 2016, pages 1307–1324
	Abstract:	The problem of eco-driving is analyzed for an urban traffic network in presence of signalized intersections. It is assumed that the traffic light timings are known and available to the vehicles via infrastructure-to-vehicle communication. This work provides a solution to the energy consumption minimization while traveling through a sequence of signalized intersections and always catching a green light. The optimal- control problem is non-convex because of the constraints coming from the traffic lights; therefore, a sub-optimal strategy to restore the convexity and solve the problem is proposed. Firstly, a pruning algorithm aims at reducing the optimization domain by considering only the portions of the traffic light's green phases that allow to drive in compliance with the city speed limits. Then, a graph is created in the feasible region in order to approximate the energy consumption associated with each available path in the driving horizon. Lastly, after the problem convexity is recovered, a simple optimization problem is solved on the selected path to calculate the optimal crossing times at each intersection. The optimal speeds are then suggested to the driver. The proposed sub-optimal strategy is compared with the optimal solution provided by dynamic programming for validation purposes. It is also shown that the low computational load of the presented approach enables robustness properties and results very appealing for online use.
	Database:	Wiley Online Library

8	Title:	Coordination arrival control for multi-agent systems
	Author:	Rui Li, YingJing Shi and Kok Lay Teo
	Journal:	International Journal of Robust and Nonlinear Control, Volume 26, Issue 7, May 2016, pages 1456–1474
	Abstract:	The coordination arrival problems of first-order multi-agent systems with the arriving structure and the time structure requirements are considered for the cases with no obstacle and obstacle. To describe the distributed coordination arrival problems, we first introduce needed definitions, such as

		coordination arrival, threat point, and arrival structure. By selecting the estimated value of the arriving time of the agent as variable, we then develop a central estimating algorithm, which is used to construct the arriving protocols. Based on the estimating algorithm, we build and analyze coordination arriving protocols for the proposed coordination arrival problems. Several simulation examples are presented to validate the proposed algorithms.
	Database:	Wiley Online Library

9	Title:	Light-based circadian rhythm control: Entrainment and optimization
	Author:	Jiaxiang Zhang, Wei Qiao, John T. Wen, Agung Julius
	Journal:	Automatica, Volume 68, June 2016, Pages 44–55
	Abstract:	Light is a strong synchronizer for circadian rhythm — the 24-h biological oscillation in plants, insects, and mammals. This paper considers the circadian entrainment problem for a popular circadian oscillation model (the Kronauer model) by using light intensity as the control input. This problem is commonly encountered by shift workers and international travelers — how to shift the phase of one's circadian rhythm by a specified amount, preferably as fast as possible? We consider three approaches: 1. Periodic entrainment: use the light/dark cycle corresponding to the desired circadian rhythm as the light input. 2. Optimal entrainment: use light input to shift the circadian rhythm to the desired state in minimum time. 3. Feedback entrainment: use circadian state feedback to adjust light input. For feedback entrainment, we consider two cases: active lighting control which can inject artificial lighting on demand and subtractive lighting control which only blocks the ambient lighting. For the periodic entrainment, which is used as a baseline for comparison, we apply the harmonic balance method to assess the existence of a stable periodic solution, and verify the result by simulation. For the minimum time entrainment, we present an efficient solution to the two-point boundary value problem and show that active lighting control significantly reduces the entrainment time from the baseline. The feedback algorithm augments the periodic entrainment with a circadian state feedback to account for modeling error and noise. Results from this study provide new insight and guideline to light intensity control for circadian rhythm regulation.
	Database:	ScienceDirect

10	Title:	Complexity of equilibrium in competitive diffusion games on social networks
	Author:	Seyed Rasoul Etesami, Tamer Başar
	Journal:	Automatica, Volume 68, June 2016, Pages 100–110

Abstract:	In this paper, we consider the competitive diffusion game, and study the existence of its pure-strategy Nash equilibrium when defined over general undirected networks. We first determine the set of pure-strategy Nash equilibria for two special but well-known classes of networks, namely the lattice and the hypercube. Characterizing the utility of the players in terms of graphical distances of their initial seed placements to other nodes in the network, we show that in general networks the decision process on the existence of pure-strategy Nash equilibrium is an NP-hard problem. Following this, we provide some necessary conditions for a given profile to be a Nash equilibrium. Furthermore, we study players' utilities in the competitive diffusion game over Erdos–Renyi random graphs and show that as the size of the network grows, the utilities of the players are highly concentrated around their expectation, and are bounded below by some threshold based on the parameters of the network. Finally, we obtain a lower bound for the maximum social welfare of the game with two players, and study sub-modularity of the players' utilities.
Database:	ScienceDirect