# Editorial

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In paper 1, an improved functional link artificial neural network (FLANN) is presented and applied it to the dynamic modelling for sensors. The simulation and experimental results of the infrared temperature sensor's dynamic modelling demonstrated the improved FLANN method has higher convergence rate and more robustness. Compared with the traditional FLANN method, the improved FLANN method differs greatly in the calculation of partial derivatives of the weighting parameters and the dynamic model's output.

In paper 2, a new online identification technique is proposed for single-input single-output processes in the frequency domain. The method can identify multiple points on process frequency response over the frequency range of interest, so that an accurate transfer function can be obtained directly by matching the model in the frequency domain. Simulation results validated the effectiveness and practicality of the proposed method.

In paper 3, the three-dimensional finite element model is established through choosing proper shape of side wedge and simulated the automotive semi-axis with smooth transition surface by choosing suitable technological parameters. The process of MCWR forming automotive semi-axes is feasible and provides the reliable theory foundation for design of MCWR dies rolling automotive axes.

In paper 4, an automatic multi-node constrainable algorithm (AMCA) is developed for inconsistent mesh based on the classic shape function theory. Each constraining function is set up with AMCA between one node in a surface and all the nodes with the approximate element in the other surface by taking an intermediate point as bridge. Its effectiveness is illustrated through dealing with a dual-plate problem and an application in truck frame. Compared with contact algorithm, AMCA has only a little increase in the stiffness of the structure and achieves satisfying displacement and stress solutions with great efficiency and speed.

In paper 5, a novel model order reduction technique via rational transfer function fitting and eigenmode analysis considering residues is presented. A constant is defined as a key in the sorting algorithm as one of correlations in order to sort the order of eigenvalues. The accuracy via eigenmode analysis considering residues is improved and the proposed algorithm is a general method to match pole values with frequency domain poles for linear RC and RLC systems.

In paper 6, a paradigm is proposed that consists of a closed-loop system identification algorithm in terms of Laguerre orthogonal functions are presented to handle variable transport time delay system. The identification algorithm does not require any special excitation signal. Two-closed-loop transfer functions (time domain and frequency domain) from the set point signal to the control input and output are identified using Laguerre orthogonal functions. A plant model is then computed based on the two-closed-loop transfer functions. The new identification and control design strategies are used to design controllers for the Cummins virtual engine.

In paper 7, in order to handle a few multi rate control systems that could not apply the primitive independent component analysis (ICA) algorithm for the surveillance of industrial process, several methods of multivariate statistical modelling ICA are proposed on dual rate system whose variables are correlated to each other. Furthermore, a strategy of renovation of ICA model on the dual rate system is also suggested with restricted number of new samples to replace the equally number of the earliest one.

In paper 8, it is well-known that, for linear systems, the frequency response function (FRF) can be considered as inherent and invariant. Thus, totally independent of input signals, which makes it, is useful to analysis and controller design. Similarly, for the weakly non-linear systems, the generalised frequency response functions (GFRFs) play a important role, and the interpretations of the GFRFs with respect to different input situations can be argued. In this paper, based on parametric modelling, the dependence and independence of input signal amplitudes for GFRFs are discussed.

In paper 9, the particle swarm optimisation (PSO) algorithm is proposed for estimating the parameters of non-linear fractional order rational models. The fractional order rational model structure is more general for non-linear rational models. The PSO estimator is convergent in certain conditions and the proposed PSOE can be used for practical problems.

In paper 10, a series of elastic and elastoplastic large deflection analyses are performed applying non-linear FEM codes, ULSAS and ANSYS in order to clarify and examine the fundamental buckling and progressive collapse behaviours of unstiffened and stiffened curved plates subjected to axial compressive load. On the basis of the numerical results, influences of curvature, magnitude of initial deflection, slenderness ratio and aspect ratio on the characteristics of the buckling/ultimate strength and progressive collapse behaviour of unstiffened and stiffened curved plates under axial compression are discussed.

In paper 11, a model-based inferential control scheme is presented for the dual-rate sample system with different output sampling and input updating. The stability robustness is analysed in the presence of model-plant mismatch (MPM). Furthermore, a robust algorithm with extremely low computational requirements is obtained by combining with a global uncertainty description and an uncertainty band-updating procedure.

In paper 12, a generalised minimum variance controller is designed for linear multi-input multi-output time-varying systems. It extends the SISO LTV GMVC from LTV SISO systems for LTV MIMO plants. It extends also the LTV MIMO MVC by adding a penalised term of control variables to the minimum variance cost functional in order to reduce excessive control action and achieve accurate output tracking performance. Simulation shows that LTV MIMO system with GMVC is stable and there is no excessive fluctuation in the control variables.

In paper 13, the problem of stabilisation and control of first order linear systems subject to input delay and presented the conditions is investigated. The stability conditions were used to design an observer (predicting) scheme that provided adequate convergent error. The proposed scheme results are similar to the traditional Smith Predictor that can be used on the case of stable systems. The observer scheme is complemented by the use of a PI compensator to follows step reference signals.

In paper 14, robust controllers that ensure closed-loop pole placement are designed for uncertain discrete-time switched systems. The switched static output feedback controllers are designed to ensure both quadratic stabilisation of the resulting closed-loop system and pole location inside a circle for each linear mode of operation. It is worthy mentioning that the switching rule is state-dependent and do not rely on any uncertainties, and all results are given in terms of linear matrix inequalities (LMIs), which can be easily tested with efficient algorithms.

In paper 15, the imitation model of NIRS physiological inspection is established through applying Monte Carlo method in scanning style NIRS inspection. The scanning style NIRS inspection has much higher resolution than normal fNIRS style inspection.

In paper 16, the dynamics of spatial interacting populations is investigated by using feedback control approach. Based on modelling error compensation techniques, a control approach is developed, which is not only robust against model uncertainties, but also use the minimum information from the system. The proposed control law is able to synchronise spatial interacting populations via an external forcing on the predator population.

In paper 17, a new innovation-based adaptive estimation unscented Kalman filter (UKF) is developed to solve the degradation performance caused by CNS unstable measurement disturbances in the SINS and CNS hybrid system. The proposed adaptive unscented Kalman filter (AUKF) is based on the maximum likelihood criterion for the proper computation of the filter innovation covariance and hence of the filter gains. The theoretic results are tested in the SINS/CNS integrated navigation system. It is can be seen from the numerical examples that the adaptive unscented Kalman filter outperforms the extended Kalman filtering (EKF) and conventional UKF with higher accuracy and robustness.

In paper 18, an interpolator is proposed and then the entire model with a numerical control interpolator of a feedrate system is built. The reference velocity of current interpolator period, the velocity limit, the dynamic equations and the new interpolation point are dealt with. The algorithm can adjust the feedrate and guarantee the servo units to achieve the interpolation point in time.

In paper 19, a new method for designing a weigh feeder control system is proposed. Because of the model of a weigh feeder cannot be obtained accurately, it is approximated as a first-order plus integrator system, and a self-tuning controller is designed on the basis of the approximated model to estimate its gain recursively. The proposed controller has a simple structure and its parameters can be understood intuitively.

In paper 20, an adaptive parameter computing method for monomodal image registration is proposed. The energy functional with probability density function is applied to search the weight parameter corresponding to the local degrees of variability in matching. The weight parameter setting is self-adjusted according to the image structures. The method is less sensitive to the choice of the parameter, and effective in computation.

In paper 21, a variable step-size normalised least mean square (NLMS) algorithm is presented for the applications where the unknown filter has an exponential decay impulse response. It employs a variable vector step size on the basis of maximising the decrease of the mean square deviation (MSD). The idea of utilising variable vector step size can be expanded to other variable step-size NLMS algorithms.

In paper 22, an improved compensation method named improved structure invariance compensation (ISIC) based on structure invariance principle is presented. Because the large extraneous force caused by strong disturbance of the rudder displacement affects the static and dynamic performances of electrohydraulic loading system seriously, the ISIC method is used to correct phasic lag of estimative velocity. Moreover, based on Fourier series, corrected velocity is extended to different frequency points. And tracking control of multi-frequency signal is realised. The real loading experiment results indicate that ISIC control method could compensate extraneous force effectively.

In paper 23, a new nodes localisation approach in WSNs is presented, which uses two new variables, proportionality coefficient and deviation. This idea is different from the generally used least square nodes localisation methods which only take coordinate of nodes into account. The result shows that if the measurement error between a blind node and its adjacency node is a linear combination of a fixed proportion and fixed deviation, the real position of blind nodes can be determined by filtering the errors. Even though the proportionality coefficient and deviation are uncertain, if the changes generated by random disturbance are small enough, the localisation errors can be reduced greatly by using the proposed method. Only the measurement errors and the stability of the measurement are needed and the communications cost is not required. The algorithm of this approach can be implemented by parallel computations.