List of Figures

		Page No.
Fig. 1.1	Trajectories starting from two nearby points.	08
Fig. 1.2	Stability region of linear fractional-order system with order q.	15
Fig. 2.1	Phase portraits of fractional order Vallis system for fractional order $q = 0.97$.	45
Fig. 2.2	Phase portraits of fractional order Vallis system for fractional order $q = 0.981$.	45-46
Fig. 2.3	Plots of $x(t), y(t), z(t)$ of the controlled system (2.7): (a) at equilibrium point E_1; (b) at the equilibrium point E_2; (c) at the equilibrium point E_3; (d) plots of control functions $u_1(t), u_2(t), u_3(t)$ at E_1.	48-49
Fig. 2.4	Phase portraits of fractional order El-Nino system for fractional order $q = 0.93$.	53
Fig. 2.5	Phase portraits of fractional order El-Nino system for fractional order $q = 0.934$.	53-54
Fig. 2.6	Plots of $x(t), y(t), z(t)$ of the controlled system (2.17): (a) at equilibrium point P_1; (b) at the equilibrium point P_2; (c) at the equilibrium point P_3; (d) plots of control functions $u_1(t), u_2(t), u_3(t)$ at P_1.	55-57
Fig. 2.7	State trajectories of master system (2.19) and slave system (2.20) for fractional order $q = 0.7$: (a) synchronization between x_1 and x_2; (b) synchronization between y_1 and y_2; (c) synchronization between z_1 and z_2; (d) the evolution of the	

error functions $e_1(t), e_2(t)$ and $e_3(t)$. 59-60

Fig. 2.8 State trajectories of the systems (2.19) and (2.20) for fractional order $q = 0.9$: (a) synchronization between x_1 and x_2; (b) synchronization between y_1 and y_2; (c) synchronization between z_1 and z_2; (d) the evolution of the error functions $e_1(t), e_2(t)$ and $e_3(t)$. 61-62

Fig. 2.9 State trajectories of the systems (2.19) and (2.20) for order $q = 0.981$: (a) synchronization between x_1 and x_2; (b) synchronization between y_1 and y_2; (c) synchronization between z_1 and z_2; (d) the evolution of the error functions $e_1(t), e_2(t)$ and $e_3(t)$. 63-64

Fig. 2.10 State trajectories of the systems (2.19) and (2.20) for $q = 1$: (a) synchronization between x_1 and x_2; (b) synchronization between y_1 and y_2; (c) synchronization between z_1 and z_2; (d) evolution of the error functions $e_1(t)$, $e_2(t)$ and $e_3(t)$. 65-66

Fig. 3.1 Phase portraits of Lu hyperchaotic system for $q = 0.95$: (a) in $x_1 - x_2 - x_3$ space; (b) in $x_1 - x_2 - x_4$ space. 74

Fig. 3.2 Phase portraits of 4D Integral order hyperchaotic system for $q = 0.95$: (a) in $y_1 - y_2 - y_3$ space; (b) in $y_1 - y_2 - y_4$ space. 75

Fig. 3.3 Phase portraits of Lu hyperchaotic system with uncertainties and disturbances for $q = 0.95$: (a) in $x_1 - x_2 - x_3$ space; (b) in $x_1 - x_2 - x_4$ space. 77

Fig. 3.4 Phase portraits of 4D Integral order hyperchaotic system with uncertainties and disturbances for $q = 0.95$: (a) in $y_1 - y_2 - y_3$ space; (b) in $y_1 - y_2 - y_4$ space. 78

Fig. 3.5 Phase synchronization for signals: (a) between x_1 and y_1; (b) between x_2 and y_2 (c) between x_3 and y_3; (d) between x_4 and y_4; (e) The evolution of the error functions of uncertain hyperchaotic systems; (f) The evolution of the error functions of hyperchaotic systems, for fractional order derivative $q = 0.95$. 80-82

Fig. 3.6 Anti-phase synchronization for signals : (a) between x_1 and y_1; (b) between x_2 and y_2; (c) between x_3 and y_3; (d) between x_4 and y_4; (e) The evolution of the error functions of uncertain hyperchaotic systems; (f) The evolution of the error functions of hyperchaotic systems, for fractional order derivative $q = 0.95$. 84-87

Fig. 4.1 Phase portraits of the complex Lorenz system for the order of derivative $q = 0.95$. 94-95

Fig. 4.2 Phase portraits of the complex Lu system for the order of derivative $q = 0.95$. 96-97

Fig. 4.3 The evolution of the error functions at $q = 0.95$: (a) evaluation of $e_1'(t)$; (b) evaluation of $e_2'(t)$; (c) evaluation of $e_3'(t)$; (d) evaluation of $e_4'(t)$; (e) evaluation of $e_5'(t)$. 100-102

Fig. 5.1 Phase portraits of fractional order T-system for fractional order $q = 0.95$. 107-108

Fig. 5.2 Phase portraits of fractional order T-system for fractional order

$q = 0.94$. 108

Fig. 5.3 Plots of $x(t)$, $y(t)$, $z(t)$ of the controlled system (5.8): (a) at equilibrium point E_1; (b) at the equilibrium point E_2; (c) at the equilibrium point E_3. 111-112

Fig. 5.4 Phase portrait of the Lorenz system for the order of derivative $q = 0.993$. 113

Fig. 5.5 State trajectories of error functions $e_1(t), e_2(t)$ and $e_3(t)$ of master system (5.12) and slave system (5.13) for fractional order $q = 0.993$. 117

Fig. 6.1 Phase portraits of fractional order (a) Newton-Leipnik system; (b) Liu system; (c) Lotka-Voltra system; (d) Chen system for the order of derivative $q = 0.95$. 125

Fig. 6.2 Combination synchronization among three fractional order chaotic systems (6.5), (6.6) and (6.7) for fractional order $q = 0.95$: (a) between $x_1(t) + z_1(t)$ and $y_1(t)$; (b) between $x_2(t) + z_2(t)$ and $y_2(t)$; (c) between $x_3(t) + z_3(t)$ and $y_3(t)$; (d) the evaluation of error functions $e_1(t), e_2(t)$ and $e_3(t)$. 129-130

Fig. 6.3 Combination synchronization among four fractional order chaotic systems (6.5), (6.6), (6.7) and (6.8) for fractional order $q = 0.95$: (a) between $x_1(t) + y_1(t) + z_1(t)$ and $w_1(t)$; (b) between $x_2(t) + y_2(t) + z_2(t)$ and $w_2(t)$; (c) between $x_3(t) + y_3(t) + z_3(t)$ and $w_3(t)$; (d) the evaluation of error functions $e_1(t), e_2(t)$ and $e_3(t)$. 135-136

Fig. 6.4 The evaluation of error functions $e_1(t)$, $e_2(t)$ and $e_3(t)$ at $q = 1$: (a) for three systems; (b) for four systems. 136-137

Fig. 7.1 Dual synchronization scheme of complex chaotic systems. 144

Fig. 7.2 Phase portraits of fractional order complex T system for fractional order $q = 0.94$. 146

Fig. 7.3 State trajectories of the master systems (7.6) and (7.7) and response systems (7.8) and (7.9) for order $q = 0.96$: (a) synchronization between $k_{11} * x_{11}(t)$ and $x_{21}(t)$; (b) synchronization between $k_{12} * x_{12}(t)$ and $x_{22}(t)$; (c) synchronization between $k_{13} * x_{13}(t)$ and $x_{23}(t)$; (d) synchronization between $k_{14} * x_{14}(t)$ and $x_{24}(t)$; (e) synchronization between $k_{15} * x_{15}(t)$ and $x_{25}(t)$; (f) synchronization between $k_{21} * y_{11}(t)$ and $y_{21}(t)$; (g) synchronization between $k_{22} * y_{12}(t)$ and $y_{22}(t)$; (h) synchronization between $k_{23} * y_{13}(t)$ and $y_{23}(t)$; (i) synchronization between $k_{24} * y_{14}(t)$ and $y_{24}(t)$; (j) synchronization between $k_{25} * y_{15}(t)$ and $y_{25}(t)$; (k) The evolution of the error functions $e_{ij}(t)$, $i = 1, 2$ and $j = 1, 2, ..., 5$. 152-154