The corresponding *internal structure* of the given ***chaotic Nosé-Hoover system*** is compatible with the ***canonical structure*** derived above for general case of the state space energy motivated approach, and is displayed in the Fig. 16.

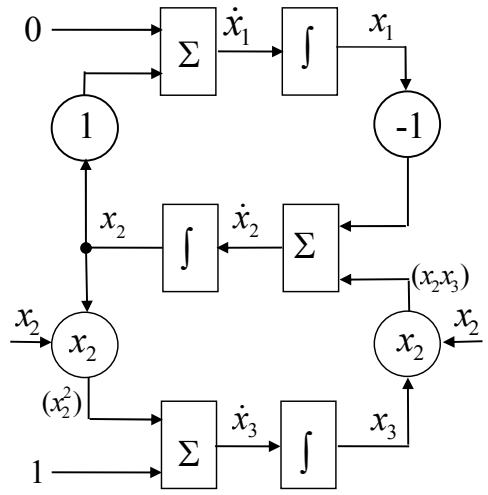

Fig. 16. Structure of the 3rd order Nosé-Hoover system

The theoretical conclusions have been verified by computer experiments. Some of the most typical are illustrated by following figures.

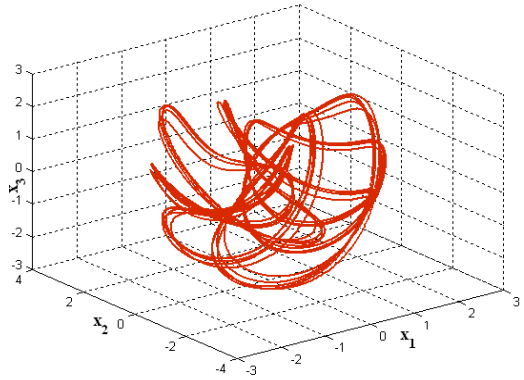

Fig. 17. Typical course of state space trajectories.

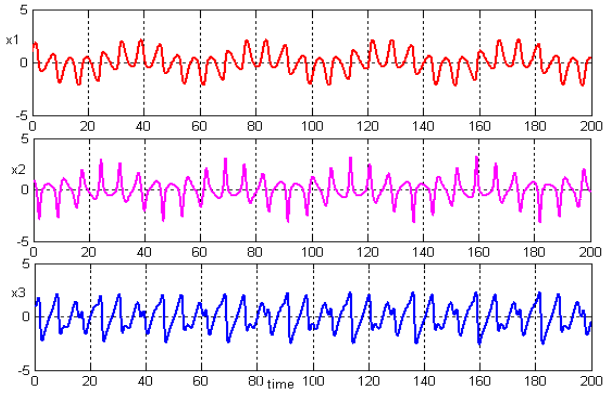

Fig. 18. Time evolution of state space trajectories.

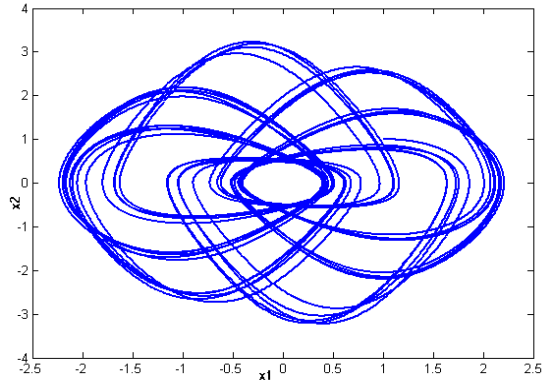

Fig. 19. 2-D projection into the state plane (x_1, x_2)

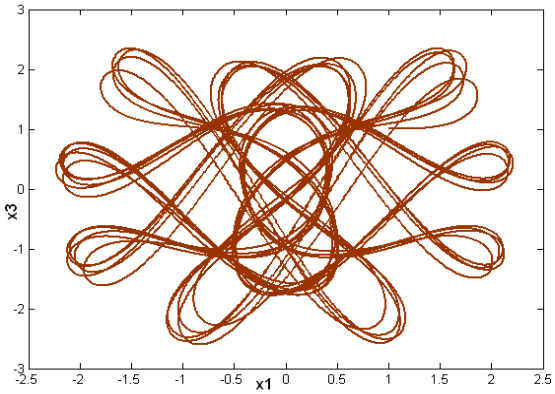

Fig. 20. 2-D projection into the state plane (x_1, x_3)

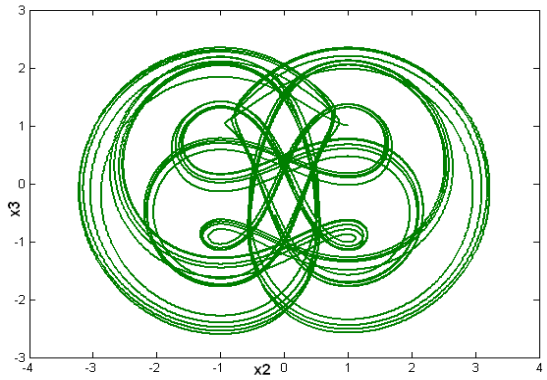

Fig. 21. 2-D projection into the state plane (x_2 , x_3)

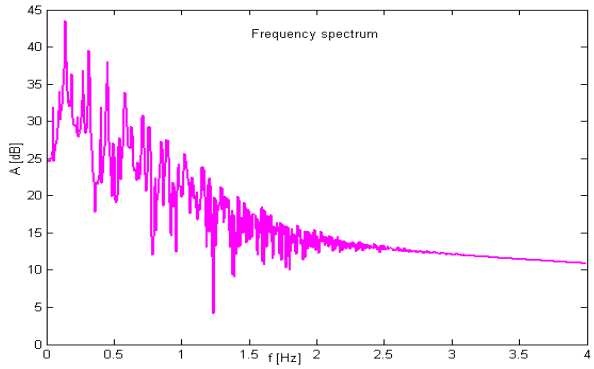

Fig. 22. Frequency spectrum of the output signal x_1.

Note that in the given structure ***chaos occurs for all coefficients equal to unity, and so it is especially simple in that sense.***

11 Conclusions

The proposed state space energy based approach seems to open a new perspective in development of sufficiently universal and more adequate abstract system representations for variety of natural systems. A wave–like form of the hyper-energy, together with the new concept of spin structure provides a new paradigm for research of interactions in nano-scale. It also seems to open promising new directions for further work in the field of quantum-chaotic systems.

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