SPACE TRAJECTORY DESIGN:
CHALLENGES AND CONCEPTS FOR OPTIMIZATION

ASTRONAUTICAL ENGINEERING DEPARTMENT SEMINAR

OSSAMA ABDELKHALIK

Professor

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- 15.00 -

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Faculty of Aeronautics and Astronautics
TAV CONFERENCE ROOM

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UÇAK VE UZAY BİLİMLERİ FAKÜLTESİ
250. YIL SEMİNERLERİ

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Seminar Summary

A main challenge in designing interplanetary trajectories is the fact that the number of design variables varies among different solutions. Global optimization methods that optimize this type of multi modal objective functions can only handle problems of fixed number of design variables. This talk discusses recent advances in evolutionary algorithms that address this problem, and their impact on the problem formulation and the obtained solution. One method that will be discussed in this talk, developed to handle global variable size design space optimization problems, is the Hidden Genes Genetic Algorithm. In this method, variable-length solutions (chromosomes) are handled by hiding some genes in a long chromosome string. Another method is the Structured-Chromosome Genetic Algorithm in which a chromosome is represented by a link list data structure. This structure enables crossover between solutions of different lengths. These methods have the capability to determine the number of swing-bys, the planets to swing-by, launch and arrival dates, and the number of deep space maneuvers as well as their locations, magnitudes, and directions, in an optimal sense. The talk will present results of applying these methods to several interplanetary trajectory design problems.

Prof. Dr. Ossama Abdelkhalik

Ossama Abdelkhalik is a professor in the Department of Aerospace Engineering at Iowa State University, in Ames, Iowa. Dr. Abdelkhalik received his Ph.D. in aerospace engineering from Texas A&M University, as well as a B.S. and M.S. degrees in aerospace engineering from Cairo University, Egypt. His research interests are in the areas of orbital mechanics, spacecraft dynamics, optimal control, and space trajectory optimization. He authored and co-authored more than a hundred journal and conference articles. Dr. Abdelkhalik is Associate Fellow of AIAA. He is associate editor for the Springer Astrodynamics journal. Dr. Abdelkhalik is a senior member of the American Astronautical Society (AAS), and a member of the AIAA Technical Committee on Astrodynamics; he was the AIAA General Chair of the 2022 AAS/AIAA Astrodynamics Specialist Conference.

Date : **June 12th, 2023 Monday**
Time : **15:00**
Place : **ITU Faculty of Aeronautics and Astronautics, TAV Conference Room**