

M.Sc. thesis abstract

Title: Design and Optimization of Proportional Navigation Strategies

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In the last few decades, Proportional Navigation is used as an effective guidance method in air-to-air and surface-to-air homing missiles.

Different strategies based on Proportional Navigation have been developed in the past few years. Although, the latest strategy, called Ideal proportional Navigation (IPN), has significant advantages to order strategies, no work has been published regarding the optimality of relevant "Navigation Constant" for these strategies.

In this thesis, these strategies have been studied in order to derive some optimal values for Navigation Constant. Two different performance indices are introduced; the total consumption energy in controlling system, and the duration of missile flight.

For each performance index, the optimum value of Navigation Constant is derived for a missile without lag and with a first order lag. In order to achieve an optimal trajectory for the missile, it is shown that the Navigation Constant should be changed during the flight, therefore it is suggested that latest controlling systems such as Fuzzy Logic Control be applied in a real missile for fine tuning of Navigation Constant. It is also shown that the missile's lateral acceleration depends on the launching angle. The critical launching angle which requires maximum lateral acceleration is derived in this thesis.

B.Sc. thesis abstract

Title: Powder Metallurgy: Cold Isostatic Pressing Technology

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Manufacturing of parts with complex shapes, high strength, composite structure, no residue stress, and a lot more advantages resulted in huge development of Isostatic Pressing of Powder Metallurgy in recent years.

Present thesis is focused on the Cold Isostatic Pressing (CIP) technique in which the compact is not heated after pressing. The fundamental, theoretical, and experimental points of this method have been studied in depth. To implement such a technique, we have chosen "Wet Bag" method and complete set of equipments including pressure vessel, silicon rubber die and cage have been fabricated. The technical specifications and related drawings of the experimental setup are presented in Section 3. Different metallic and ceramic compacts were manufactured and tested using this method and their mechanical test results have been presented at the end.