Transformation Synthesis
for Euler-Lagrange Systems

M. Mabrouk [1], S. Ammar [2*] and J.-C. Vivalda [3]

[1] *Faculté des sciences de Gabès – Cité Riadh – Zirig 6072 Gabès – Tunisie*
[2] *ISIT.Com de Hammam Sousse – Route principale Numéro 1 – 4011*
Hammam Sousse – 4002
[3] *Inria-Lorraine et LMAM (UMR 7122) – Université de Metz*
Ile du Saulcy – 57045 Metz Cedex 01 – France

Abstract: The transformation of Euler-Lagrange systems, with the variable of position as output, in order to solve some interesting problem as the design of observer is considered in this paper. First, we will provide a necessary and sufficient condition, which ensures the transformation of such system into some structure affine in the velocities, as well as a method to compute this transformation. For a particular family of Euler-lagrange systems with two degree of freedom we will present a change of coordinates which makes the dynamics triangular with respect to the velocities and a globally asymptotically converging observer is provided. To illustrate the approach, it is applied to the Cart-pendulum system.

Keywords: *Euler-Lagrange systems; state transformation; affine forms; cart-pendulum.*

Mathematics Subject Classification (2000): 70H03, 93B10, 93B27, 93C15, 93D15, 93D25.