July,3
12:05
Solar Energy and Agriculture

Soiling Monitoring Modelling for Photovoltaic System

Vitor H. Pagani[1,2], Nelson A. Los[1,2], Wellington Maidana[1], Paulo Leitão[1], Marcio M. Casaro[2] and Claudinor B. Nascimento[2]

[1]Research Center in Digitalization and Intelligent Robotics (CeDRI), Instituto Politécnico de Bragança,Campus de Santa Apolónia, 5300-253 Bragança, Portugal
[2]Universidade Tecnológica Federal do Paraná, Campus de Ponta Grossa, PR, Brasil

Soiling on photovoltaic panels is a factor that has a significant impact on photovoltaic production. The monitoring of the soiling index appears as a relevant alternative for maintenance of solar systems. This work proposes a soiling index modelling for photovoltaic systems, based on two input variables: solar radiation and current generated, providing a simple, programmable and reliable way to check the efficiency and establish parameters for cleaning the system. The study performed was based on the adaptation of the modelling, mathematical experimentation of the model presented and the comparison between the system presented with the PVSyst software, for validation of the proposed system. From the validation, was proposed to establish an optimal point for cleaning. Was found that, despite the developed system using only two input variables, it presented a low relative error of 2.07% when compared to the software. From the results obtained, we can conclude that the presented modelling system is valid, and presents excellent reliability, having vast applicability in the monitoring of solar producers of any model or size.

July,3
17:25
Control in Point Vortex Dynamics

The numerical control of the motion of a passive particle in a point vortex flow

Carlos Balsa[1] and Sílvio M. Gama[2]

[1]Research Centre in Digitalization and Intelligent Robotics (CeDRI) - Instituto Politécnico de Bragança, Bragança, Portugal
[2]CMUP - Centro de Matemática da Universidade do Porto, Porto, Portugal

This work reports numerical explorations in the advection of one passive tracer by point vortices living in the unbounded plane. The main objective is to find the energy-optimal displacement of one passive particle (point vortex with zero circulation) surrounded by N point vortices. The direct formulation of the corresponding control problems is presented for the case of $N = 1$, $N = 2$, $N = 3$ and $N = 4$ vortices. The restrictions are due to (i) the ordinary differential equations that govern the displacement of the passive particle around the point vortices, (ii) the available time T to go from the initial position z0 to the final destination zf; and (iii) the maximum absolute value umax that is imposed on the control variables. The resulting optimization problems are solved numerically. The numerical results show the existence of nearly/quasi-optimal control.
