Roundtable Topic:

Gnosis for Maintenance: From Diagnosis to Prognosis and Health Aware Control

Organizers:

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Abstract:

Maintenance has always been essential for many engineering systems and processes. In several domains like transport (automotive, rail, maritime), the vision is to render maintenance automated using numerous sensors for monitoring and providing data and sophisticated algorithms to decide among others: (i) when to perform maintenance, (ii) which components need maintenance, (iii) whether we can prolong maintenance, (iv) how to optimize maintenance. To address these questions in real time, **fault diagnosis** procedure is important to detect the malfunctioning of a system, to isolate the cause of malfunctioning, and if possible to identify the severity. The next step is to define the remaining useful life until fault becomes a failure through a **prognosis** procedure. Great impact on the evolution of system malfunctioning can have the closed-loop operation of the system; it may delay or accelerate the evolution according to **control** decisions. How can we perform the health management and maintenance of the system in an automatic control context, or how can we control a system in a health management and maintenance context (e.g. what-if design)? This is the main research question that will be discussed in this roundtable with panelists that are well-known experts in the field of maintenance, prognostics and health-aware control in Europe and Canada.

Goals of the Roundtable:

❖ Classification the state-of-the-art (academia) and the state-of-practice (industry) methods for maintenance, prognosis, and health-aware control

❖ Determination the results (expectations) of a maintenance method

❖ Discussion on the health aware control and its development in industry/academia, and its relationship with fault tolerant control

❖ Discussion on the relationship between: (i) predictive maintenance and prognosis, (ii) predictive maintenance and diagnosis/monitoring, (iii) prognosis and closed-loop control

❖ Discussing how predictive maintenance and prognostics could be part of a controlled system considering nonlinear dynamics, uncertainties, and different time scales, and how control and maintenance can benefit each other

❖ Discussing the challenges (of implementation) of predictive maintenance, prognosis and health-aware control

❖ Presentation of most popular industrial use cases of health aware control

List of Panelists:
1. **Vicenç Puig**, Professor at Technical University of Catalunya (UPC), Spain.
   Participation: in-person
   URL: **https://futur.upc.edu/VicencPuigCayuela?locale=en**
2. **Jin Jiang**, Professor at University of Western Ontario, Canada.
   Participation: in-person
   URL: **http://cies-western-eng.ca/jjiang/home.htm**
3. **Alfredo Núñez**, Associate Professor at Delft University of Technology, the Netherlands
   Participation: Virtual (most probably if the roundtable is NOT on the 5th of June)
   URL:
   https://www.tudelft.nl/staff/a.a.nunezvicencio/?cHash=e28eb14253b4e17f43573e940 0884c3f

Duration of the roundtable: 1h-1.5h

Structure of the roundtable:
- All panelists will be given a set of questions (around April) based on the goals of this roundtable, which should be addressed **briefly**.
- We will collect the answers and analyse them.
- During the roundtable we'll present a list of questions, where each question will be accompanied with a list of predefined answers that we will have analysed.
- The audience will be asked to choose an answer or to prioritize them using e.g. Mentimeter or Kahoot.
- The panelists will have a discussion on the specific question considering the feedback from the audience