MECHANICAL ENGINEERING SEMINAR

Wednesday, June 7, 2023 at 12:30, D. Dan and Betty Kahn Building, Auditorium **6**

"*Synchronization revisited: standing on the shoulders of Christiaan Huygens*"

Prof. Dr. Henk Nijmeijer

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Hosted by: Prof. Alon Wolf, Dean and Prof. Oded Gottlieb

In 1665 the Dutch scientist Christiaan Huygens 'discovered' the in-phase and anti-phase synchronization of two pendulum clocks hanging on the wall. This 'sympathy' of clocks, as Huygens called such coordinated motion, has been observed in different areas like physics, nature, biology, and engineering. The study of synchronization relies on a thorough understanding of the underlying dynamics of (time-delayed) coupled systems and extends also to larger groups of coupled systems. The purpose of the talk is to review a range of exiting and interesting examples of synchronized systems and in particular to focus on the means why pairs of coupled identical (oscillating) systems may exhibit identical oscillatory motion. Moreover, a framework is developed that allows the analysis of synchronization and partial synchronization in a network of coupled identical systems. Particular focus in this regard will be given to real-world networks of coupled identical systems – like a brain or traffic or an ensemble of robots- and how synchrony can be enforced in such a system. Laboratory experiments with robots and field tests with multiple wirelessly connected cars will be given.

Bio: Henk Nijmeijer (1955) is a full professor in Dynamics and Control at the Department of Mechanical Engineering of the Eindhoven University of Technology. His research field encompasses nonlinear dynamics and control and applications thereof. He is a fellow of the IEEE since 2000 and was awarded in 1990 the IEE Heaviside premium. He is appointed honorary knight of the 'Golden Feedback Loop' (NTNU, Trondheim) in 2011. Since January 2015 he is scientific director of the Dutch Institute of Systems and Control (DISC). He is recipient of the 2015 IEEE Control Systems Technology Award and a member of the Mexican Academy of Sciences. He has been Graduate Program director of the TU/e Automotive Systems program in the period 2016-2021. He is an IFAC Fellow since 2019 and as of January 2021 an IEEE Life Fellow. He is Chief Field editor of the newly established journal Frontiers in Control Engineering. He chairs the Dutch Mechanical Engineering Council and is a core member of the ICMS with focus area 'Complexity and Soft Robotics'.

Seminars Coordinator: Assoc. Prof. Matthew Suss.

MECHANICAL ENGINEERING SEMINAR

Thursday, June 8, 2023 at 12:45, D. Dan and Betty Kahn Building, Auditorium 1

"*Challenges in Cooperative and Automated Vehicles*"

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This presentation focusses on the contributions that have, among others, resulted from the Dutch I-Cave program. I-Cave stands for Integrated Cooperative and Automated Vehicles and is an academic research program that aims at a variety of aspects emerging from the development of a full-size automated vehicle. I will discuss general aspects regarding computer vision and (radar) localization, software architecture, human machine interaction aspects, demonstrator vehicles, and finally control aspects for automated and cooperative vehicles. A basic question in this regard is to what extend software architecture of a cooperative vehicle can be one to one used in an autonomous vehicle or not. I will also discuss recent experiments for cooperative adaptive cruise control (C-ACC) using cellular networking technology (G5).

H.Nijmeijer & T.J.van der Sande The Future of Moving Forward, I-CAVE, 2021

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