Program

08:30 - 09:00	הרשמה
09:00 - 09:15	אסיפת חברים – בחירת הנהלה לאיב"א
09:15 - 09:45	**Introduction**
09:45 - 11:00	**Design by Eigenspace Assignment to Detection Spaces.**
11:00 - 11:30	הפסקת קפה
11:30 - 12:30	**Design by Eigenspace Assignment to Complementary Detection Spaces**
12:30 - 13:30	ארוחת צהרים
13:30 - 14:30	**Robust Unknown Input Observers: Single Fault Detection Filters.**
14:30 - 15:30	**Robust Multiple – Fault Detection Filters.**
15:30 - 16:00	הפסקת קפה
16:00 - 17:00	**Integration of Fault Detection and Identification into a Fault Tolerant Automated Highway System**

Introduction to Model Based Methods for Fault Detection and Identification

This short course is concerned with the development of fault detection filters for analytic redundancy management. From the measurements of dissimilar instruments, the objective is to detect and identify faults in the sensors, actuators and plant. A fault is detected when the measurement residual (the difference between the measurement and the predicted measurement) in the fault detection filter crosses a given threshold. When a fault occurs, it is identified (isolated) through given geometric and invariant properties. In particular, a given fault will produce a unique invariant direction or manifold in residual space.

The course begins with a description of the fault detection problem and the dynamic system model used to design fault detection filters. Then, the geometrical structure and methodology for computing the detection gains is presented from a spectral view point leading to the construction of very general and well conditioned detection filters. Nevertheless, these fault detection filters, which are essentially observers, do not explicitly account for uncertainties in the measurements, process or plant. To address this concern, robust fault detection filters are developed which approximate the geometric structure of the spectral fault detectors, but also account for system uncertainty. These robust fault detection filters are constructed from the minimization of a properly chosen norm, i.e. disturbance attenuation problems. It is shown that in a given limit, the geometrical structure of the fault detection problem is recovered. First, filters are developed which are concerned with only announcing a single fault, an approximation to the so-called unknown input observer. Then, a multiple fault detection filter is presented which approximates the most general form of the detection filter, the restricted diagonal fault detection filter.

Simple examples are used to illustrate the theory. Examples from aircraft systems and ground vehicles illustrate the theory on meaningful problems. As a case study, the integration of fault detection and identification into a fault tolerant automated highway system is presented.

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