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Abstract for the Ph.D. dissertation entitled "Integrated fault diagnosis and fault-tolerant control strategies for multiple faults of dynamic systems"

The Ph.D. dissertation is related to fault-tolerant control issues basing on the estimation of the state as well as estimation of actuator and sensor faults.

Despite the fact that the system might be under influence of both kind of faults, the most common approaches which can be found in the literature are the ones that vanishes the influence of one of them and as a consequence, one kind of fault is taken into consideration either actuator fault or sensor fault only. Such a task allows for only partial analysis of the entire system, which entails that a significant part of the system is overlooked in the analysis. Therefore, in the following dissertation, the influence of actuator faults, influence of sensor faults and influence of simultaneous actuator and sensor faults are taken into account. Moreover, it is assumed that for the system might act process uncertainties and measurement noises. Furthermore, two fault-tolerant control strategies are proposed.

First chapter of the dissertation stands for the introduction to the subject of fault diagnosis as well as of the fault-tolerant control along with the literature review. Moreover, in this chapter, aims of the work as well as a formal thesis of the work is formulated.

In chapters 2 – 4, estimation strategies are proposed for the actuator faults, sensor faults and for the simultaneous actuator and sensor faults, respectively. Each chapter proposes the strategy for linear systems and then it is suitably extended for non-linear ones. It is assumed that the non-linear system is to be Lipschitz. Moreover, in each chapter an illustrative example with application to laboratory devices is presented.

Next, in a chapter 5, which is divided into two sections, two fault-tolerant control strategies are proposed. One of them stands for a kind of state-feedback control, while the other one is an output-feedback one. Both strategies are basing on the estimator proposed in chapter 4, which is capable for estimating the actuator and sensor faults, simultaneously. Similarly to

the chapters which provide the estimation strategy, the control strategy are proposed for the linear systems and then suitably extended to the non-linear ones being a Lipshcitz class. At the end of this chapter, an illustrative example is presented. It compares the proposed fault-tolerant control strategies with each other, and moreover, it is compared to the classical state-feedback controller without fault tolerance.

Chapter 6 provides concluding remarks and future research directions are proposed.