Faculty of Electrical Engineering & Computer Science
Master Degree Course Electronics Engineering, MSc EE

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Prototype Design of Distributed Hydraulic System.

ABSTRACT - Masterthesis

The components of several systems of aircraft are manufactured and tested at geographically distributed sites. This holds well for Airbus and also for products of other large industries. Up to now, a system integration test for such a system necessitates that all components are shipped to a single location and then cross connected and tested. In case the system integration test fails due to defects in the components, they must be shipped back to their respective manufacturers (or manufactured sites), be redesigned, and be shipped again to the system integration site. This consumes considerable time and logistical resources. ExxpertSystems aims at testing of distributed subsystems with less hindrance. The firm has already succeeded in distributed testing of mechatronic systems by transferring industry related signals over IP packets using self developed software (FastWAN). With this technology, the geographically distributed test centers can be connected via existing standard Internet links.

The aim of the thesis is to perform the simulation of the closed loop hydraulic system which has explicitly introduced delays to match the real-time distributed hydraulic system operation and to analyze the obtained results. The thesis is divided into two parts. The thesis work is inclined towards developing a working Simulink model of the simple hydraulic circuit of the high lift zero test rig system which is located at the Airbus Bremen site. This model consists of a reservoir, servo valve, accumulator and a PCU. Upon successfully simulating this, the work then moves to modeling of a reservoir, pump and control system that is part of iron bird test rig system situated at Airbus Toulouse; France. Thesis also includes usage of automated MATLAB scripts to find the gain vectors of the Proportional Integral Controller used. These two systems are interfaced to work as closed loop system on a single PC. Later a set of multiple delays ranging from 4 ms to 100 ms are introduced and simulated separately to match the real test scenario. Having performed these simulations successfully, the results obtained are studied and analyzed with respect to possibility of implementation of this method between two geographically distributed hydraulic test facilities.