MECHATRONICS BOOK SERIES

CONTROL AND INTELLIGENT SYSTEMS

Momoh Jimoh E. Salami
Abiodun Musa Aibinu
Yasir Mohd Mustafah

IIUM Press
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

MECHATRONICS BOOK SERIES

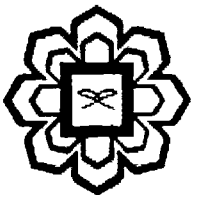
CONTROL AND INTELLIGENT SYSTEMS

EDITOR

Momoh Jimoh E. Salami

Abiodun Musa Aibinu

Yasir Mohd Mustafah



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Momoh Jimoh E. Salami, Abiodun Musa Aibinu, Yasir Mohd Mustafah: Mechatronics Book Series: Control and Intelligent Systems
Bibliography p.
Includes Index
ISBN

ISBN: 978-967-418-176-5

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel +6**03-6188 1542 / 44 / 45** Fax: +6**03-6188 1543**
EMAIL: iiumprinting@yahoo.com

Table of Content

Chapter 42
Active Suspension System: Part 2 - Controller Design and Simulation

Ayman S.I. Elzubair [a], Asan G. A. Muthalif [b], Aiman O. Bajaber [c]

Department of Mechatronics Engineering, International Islamic University Malaysia
Jalan Gombak, 53100, Kuala Lumpur, Malaysia
[a]aymanalzupair@yahoo.com, [b]asan@iium.edu.my, [c]Bajaber2020@gmail.com

42.1 Introduction

Keeping a constant distance between the chassis and wheel thereby reducing vibration output to vehicle's body is one of the main objectives of a suspension system. Typically, there are three ways to implement suspension system: passive, active and semi-active. Passive suspension system depends on springs and absorbers while the active uses a feedback control system with actuators and sensors. Semi-active system surpasses active one with regards to size and power required. It works as either passive or active suspension since the passive components are not removed but combined with the active parts. Greater degree of energy absorption can be achieved under straight-line driving, making for a smoother ride, while the suspension can automatically stiffen when the car begins to turn, and aids handling – effectively combining the best of both worlds.

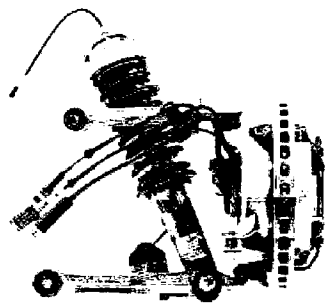


Fig. 42.1: A typical passive suspension system.

42.1.1 Typical Controllers Designed For Semi-Active Suspension

Proportional–integral–derivative (PID) controller: A PID controller is a standard feedback loop component in industrial control applications. It measures an "output" of a process and controls an "input," with a goal of maintaining the output at a target value which called the "set point". PID can be described as a set of rules with which precise regulation of closed-loop feedback control system is obtained, shown in Fig. 42.2. Proportional, integral and derivative parameters are K_P, K_I, K_D. Each of the three control functions is governed by a user-defined parameter. While PID is mostly used in SISO systems and yields superior results, this is not the case for MIMO systems. That lead us to look for an alternative controller that can be easily used for such systems.