

MECHATRONICS BOOK SERIES
SELECTED PAPERS FROM
ICOM'01, ICOM'05 AND
ICOM'08

Editors

Asan G. A. Muthalif
Amir A. Shafie
Momoh J.E. Salami



IIUM Pres

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978-967-0225-68-5

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

CONTENTS

CHAPTER ONE: Mechatronics System Design and Applications

Title	Conference	Page
Automation of Pump Test Rig System <i>Ahmad Faris Ismail, Iskandar Al Thani Mahmood, and Tasneem Pervez</i>	ICOM'01	3
Auto Cruise System: A System to Assist During Traffic Congestion <i>Taufik Yunahar, Ahmad Imran Ibrahim, Asan Gani</i>	ICOM'05	17
Low Cost SCADA System With Auto Fault Detection Using Micro Controller <i>M. Azman Shah, Khalid A. S. Al-Khateeb, And M. F. Mohammad</i>	ICOM'05	24
Traffic Light Sequencing - An Element Of Adaptability <i>Sheroz Khan, Othman O Khalifa And Azuki Abdul Salam</i>	ICOM'05	32
Thermal Shock in Periodic Edge-Cracked Plate Supported by Elastic Foundation <i>Abd El-Fattah A. Rizk</i>	ICOM'05	38
Design and Development of an Automatic Car Door Opening and Locking System <i>Md. Ataur Rahman, A.K.M Mohiuddin, Irwan, Azoa and Adly</i>	ICOM'08	48
Development Of Unmanned Vehicle Utilizing GPS System <i>M. H. Ali, S.B Abdul Hamid, M. A. Rahman</i>	ICOM'08	53
Design Of An Autopilot For An Autonomous Unmanned Aerial Vehicle <i>M. Idres and R. Kafafy</i>	ICOM'08	59

CHAPTER TWO: Modelling and Simulation

Title	Conference	Page
Finite Element Study of Composite Cones Under Axial Compression Loading <i>Asad A. Khalid, Ahmad F. Ismail and Nurul Amin A. K. M</i>	ICOM'01	69
Design and Analysis of a Solar Still Using Finite Element Method <i>M. I. Ahmed, Y. A. Abakar, T. Pervez and A. F. Ismail</i>	ICOM'01	79
Anisotropic Laminated Composite Theory for Delamination Analysis of Curved Bar <i>T. Pervez and M. I. Ahmad</i>	ICOM'01	90
Free Vibration of Variable Thickness Plates Using Characteristic Orthogonal Polynomial Strip Functions Subjected to Different Combinations of Boundary Conditions <i>Abd El-Fattah A. Rizk, Ahmed S. Ashour</i>	ICOM'01	101
Using Spline Path in Real Time Navigation Simulations Systems, in Continuous Space <i>Ahmed Mustafa, Aisha-Hassan A. Hashim and Othman Khalifa</i>	ICOM'08	112
Semi-Active Suspension System for Off-Road Vehicles <i>Zohir BenLahcene, Waleed F Faris, MD Raisuddin Khan and S.I. Ihsan</i>		119

CHAPTER THREE: Intelligent Systems

Title	Conference	Page
Intelligent Keystroke Pressure-Based Typing Biometrics Authentication System using Multilayer Feed-forward Network <i>A. Sulong, Wahyudi and M.U. Siddiqi</i>	ICOM'08	131

Proposed Intelligent Algorithm for IC Marking Image Inspection <i>Yasser H. and M. J. E. Salami</i>	ICOM'08	138
The Role of Intelligent Systems in Mechatronics Engineering <i>Nahrul Khair Alang Md Rashid</i>	ICOM'08	144

CHAPTER FOUR: Instrumentation, Dynamics and Control

Title	Conference	Page
Hardware Implementation of Intelligent Braking System <i>S. N. Sidek and M. J. E. Salami</i>	ICOM'01	151
Design And Implementation of Dsp-Based Hybrid Controller for Some Motion Applications <i>Yusuf I. Bulale, M.J.E Salami</i>	ICOM'01	156
Fuzzy Logic Based Controller for Maintaining Human Comfort within Intelligent Building System <i>Nasrodin .T. Mustapha, Momoh J. E. Salami, Nazim M. Nasiri</i>	ICOM'05	167
Design and Implementation of Fuzzy Logic Controller for Intelligent Gantry Crane System <i>Wahyudi and J. Jalani</i>	ICOM'05	173
The Use of Scanning Electron Microscope in Evaluating Insulation Property <i>A.G..E. Sutjipto , Afzeri , R. Muhida , I. Sopyan 1 & E. Haruman</i>	ICOM'05	180
A Maximum Power Point Tracking for Photovoltaic System Using Temperature Compensator Method <i>Riza Muhida, Wahyudi Martono, Afzeri, Esa Haruman, Iis Sopyan , Abdul Gani Albagul and Agus Geter Edy Sutjipto</i>	ICOM'05	187
Neural Network Controlled of an Active Engine Mounting System Using a Nonlinear Electromagnetic Actuator <i>Fadly J.D., Wahyudi M. and Waleed F. Faris</i>	ICOM'08	194

A High Linearity CMOS RF Amplifier for Power Control Module in RFID Reader (ICOM 2008)	ICOM'08	203
<i>M. J. Uddin, M.A. Hasan, M. I. Ibrahimy, A. N. Nordin, M. A. M. Ali and M. B. I. Reaz</i>		
Design and Implementation of Fuzzy Control for Two Link Flexible Manipulator	ICOM'08	209
<i>Waleed F. Faris, Wahyudi Martono and Omar H. J. Hajjaj</i>		
State Feedback Control Tuning for Flexible Joint Manipulator Using PSO with Constraint	ICOM'08	215
<i>Mahmud Iwan S., Andika Aji Wijaya, Wahyudi</i>		
Fuzzy-based NCTF Controller for PTP Positioning: Fuzzy Membership and Rule Based Modifications	ICOM'08	223
<i>Purtojo, Rini Akmelawati and Wahyudi</i>		
Analysis of Magnetorheological Brake System with a Fuzzy Logic Controller	ICOM'08	231
<i>M.M.Rashid, Momoh J. E. Salami, M.A.Abd. Rahim and M.A.Hussain</i>		
Neural-tuned PID Control for Point-to-point (PTP) Positioning System	ICOM'08	237
<i>Wali Ahmad @ Myo Min Htut and Wahyudi</i>		

CHAPTER FIVE: Machine Vision

Title	Conference	Page
Review of Image Processing in Industrial Inspection and Quality Control (ICOM 2005)	ICOM'05	245
<i>Othman O. Khalifa and Sheraz Khan</i>		
Recognition of Handwritten Arabic Characters: Challenges and Prospective (ICOM 2005)	ICOM'05	250
<i>Sarra M. Abd Al-Rahim, Othman O Khalifa</i>		

A Review of Path Detection in Intelligent Video Surveillance	ICOM'08	258
--	---------	-----

Imran Moez Khan, Yusof Zaw Zaw, Othman O. Khalifa and Lai Weng Kin

CHAPTER SIX: Speech and Image processing

Title	Conference	Page
Reduction of Motion Artifact in Portable Pulse Oximetry (ICOM 2008)	ICOM'08	267
<i>H. Malek, Othman O. Khalifa and I. Muhammad</i>		
Lossless Audio Compression using Psychoacoustic Model and Wavelet Transform (ICOM 2008)	ICOM'08	274
<i>Othman O. Khalifa, Sering Habib Harding and Aisha-Hassun A. Hasim</i>		
An Isolated Character Segmentation Approach (ICOM 2008)	ICOM'08	283
<i>Assma O. H. Ayyad, Othman O. Khalifa and Aisha Hassan</i>		
A study of Independent Component Analysis Applicability to Fetal Heart Rate Detection Using Photolethysmogaph (ICOM 2008)	ICOM'08	288
<i>H. Malek, Othman O. Khalifa and M. A. Mohd Ali</i>		
Educational Project on a Simple Voice Identification Using Frequency Cepstrum Coefficients and Vector Quantization (ICOM 2008)	ICOM'08	294
<i>H. K. Widhiputranto and R. Akmeliawati</i>		

CHAPTER SEVEN: Robotics and Automation

Title	Conference	Page
Movement Analysis for Building Intelligent Reactive Navigation Behaviours for Legged Robot	ICOM'01	303
<i>Adel Ali S. Al-Jumaily</i>		
Conceptual Design and Kinematic Analysis of Robotic Differential Gripper	ICOM'01	317
<i>Sameh Farag M. Ghobashi, Nazim Mir-Nasiri</i>		

Design Of Scara-Type Multi-Loop Robotic Arm <i>Nazim Mir-Nasiri</i>	ICOM'01	324
Humanoid Robot Head <i>A. A. Shafie, M.N. Kasyfi, N. I. Taufik Y.</i>	ICOM'08	331
Development of Mobile Photovoltaic Robot for Exploring Disaster Area <i>Riza Muhida, Suhaimi B Mohd Zaid, Wahyudi, Rifki Muhida, Ari Legowo and Akhmad Unggul</i>	ICOM'08	338
Investigation of a Novel Type of Locomotion for a Snake Robot Suited for Narrow Spaces <i>M. Watanabe, M.R. Khan</i>	ICOM'08	346
Cooperative Robot and User Friendly Robot- New Challenge in Robotics (ICOM 2008) <i>Md. Mozasser Rahman and Md. Raisuddin Khan</i>	ICOM'08	353
Inverse Kinematics of a Hyper-Redundant Robotic Manipulator <i>Syed Musrur Ahamad, Md. Raisuddin Khan, Md. Mozasser Rahman</i>	ICOM'08	358
A Gait Transition Method for Hexapod Robots <i>Md. Masum Billah, Dr. Mohiuddin Ahmed, Soheli Farhana</i>	ICOM'08	364

CHAPTER EIGHT: MEMS and Materials

Title	Conference	Page
Quality of Cu Film Electrodeposited on Silicon Wafer Using Different Current Densities <i>Shahjahan Mridha</i>	ICOM'05	373
Trimming of Atomic Force Microscope Probe Tip by Ion Milling <i>M. Y. Ali and B. H. Lim</i>	ICOM'05	381
Selection of Materials and Design Specification for Hip Joint Prosthesis <i>I. Sopyan, E. Haruman, A.G.E. Sutjipto, and R. Muhida</i>	ICOM'05	386

Generalized One-Dimensional Flow Inside Thermo-Electrically Controlled Micronozzle	ICOM'08	394
<i>Amar Hasan H and Raed Kafafy</i>		

CHAPTER NINE: MEMS and Materials

Title	Conference	Page
Intelligent Generator for Semi-Actual Test Data	ICOM'01	403
<i>Shihab A.Hameed, Abdul Majid A.Al-Abbasi</i>		
Improving Software Testing by Using Statistical Methods to General Multi-Structures Test Data	ICOM'01	414
<i>Shihab A.Hameed</i>		
Cellular Radio Based Vehicular Location Finding	ICOM'01	426
<i>Farhat Anwar</i>		
Controlling Electrical Appliances Using Global Mobile System	ICOM'05	439
<i>Sheroz Khan, Muhammad Fawzi bin Husin, Mohd Halim bin Mohd Noor</i>		
An Autonomous Integrated Architecture for the Next Generation Air Traffic Management and Avionics Systems	ICOM'05	444
<i>I Ahmed, M. J Sadiq</i>		
Overview of Radio Frequency Microelectromechanical Systems Reconfigurable Antennas	ICOM'05	450
<i>A.H.M. Zahirul Alam</i>		
Integrated Emergency and Guidance System Based on WiMAX Wireless Technology (IEGSW)	ICOM'05	458
<i>S. A. Hameed and B. A. Aliyu</i>		
Harmful Data Factors that Affect Internet's Users in Educational Industry	ICOM'05	466
<i>Shihab A. Hameed</i>		
Web based Documentation System for Dynamic Roadmaps	ICOM'05	472
<i>Sajid Hassan, Mohammad Ahsan Chishti, Farhat Anwar, Chandran Elamvazuthi</i>		

The Power of Web Portals as a Gateway to Resources and <i>Shihab A. Hameed, Mohammad Ahsan Chishti</i>	ICOM'05	480
Smart Antenna Design: An Overview <i>Zuhani Ismail Khan and Md Rafiqul Islam</i>	ICOM'05	486
Performance Study of Intra-Domain Mobility Management <i>Nazreen Rusli, Fauzana Ridzuan, Aisha Hassan Abdalla Hashim and Sajid Hassan</i>	ICOM'05	493
Performance Evaluation of Hierarchical Mobile IP <i>Aisha Hassan Abdalla, Farhat Anwar, Shaffiah Mohd, Hatina Banun Liyakthulikhhan, Sajid Hassan</i>	ICOM'05	500

CHAPTER TEN: MEMS and Materials

Title	Conference	Page
Machine Condition Monitoring and Fault Diagnosis Using Spectral Analysis Techniques <i>M.J.E. Salami, Asan Gani and T. Pervez</i>	ICOM'01	509
Development of a New Method of Crack Modeling and Prediction Algorithm <i>A. M. Aibinu, A. A. Shafie, M. J. E. Salami, A.F. Salami, I. A. Bamgbopa and W. A. Lawal</i>	ICOM'08	520
An Overview of Pulse Oximetry System for Noninvasive Monitoring <i>Muslim A. Abu-Umar, Liban A. Kassim and Othman O. Khalifa</i>	ICOM'08	528

CHAPTER ELEVEN: MEMS and Materials

Title	Conference	Page
Effect of Cooling Rate on Properties of Commercially Pure Aluminium <i>Faisal A. Rahim, Nur Izan Syahriah Bt. Hussein and M. M. Haque</i>	ICOM'01	535

Investigation of Chatter Arising during End Milling Operation on VMC and Quality of Machined Surface <i>A.K.M.N. Amin, M.A. Rizal, M. Razman</i>	ICOM'01	542
Surface Roughness of Carbides Produced by Water Abrasive Jet Machining <i>Ahsan Ali Khan, Mohd Efendee Bin Awang, Ahmad Azwari Bin Annuar</i>	ICOM'05	556
An Integrated Approach of Computer Aided Design, Rapid Prototyping and Investment Casting <i>M. M. Haque, Azdy M. Arshad and Irzal K. Helme</i>	ICOM'05	562
Pin Type Reconfigurable Clamping Ability Evaluation for Setup- Free Technology <i>Afzeri, A.G. E Sutjipto, A.K.M Nurul Amin, Riza Muhida</i>	ICOM'05	569
Workpiece Preheating Approach to Reduce Chatter and Improve Machinability of Titanium Alloy - Ti6Al4V <i>A. K. M. Nurul Amin, K. Kamaruddin, M. Abdelgadir</i>	ICOM'05	576
Effect of Processing Force on Architecture And Impact Strength of Glass Fiber Reinforced Epoxy Composites <i>A. Nazrin, S. Mridha and Mohamad A. Rahman</i>	ICOM'05	583
Investigations of the Causes of Chatter in Computer Aided Manufacturing Process during End Milling Operation <i>Md. Anayet U Patwari, A.K.M. Nurul Amin, Waleed Faris, S. Alam</i>	ICOM'08	591

Using Spline Path in Real Time Navigation Simulations Systems, in Continuous Space

Ahmed Mustafa, Aisha-Hassan A. Hashim and Othman Khalifa

*Department of Electrical and Computer Engineering, Faculty of Engineering
International Islamic University Malaysia, PO BOX 10, Kuala Lumpur, 50728, Malaysia
Phone: 03-6196-4488, Fax: 03-6196-4516, E-mail: aisha@iiu.edu.my*

ABSTRACT

This work aims to design algorithms usable by real time systems, which can simulate navigation in a graph based network, and uses curves spline's along with the straight line paths. The network will be described with minimum effort, and path number of nodes needs to be minimized. The real time system needs a light weight algorithm with minimum calculations in order for this algorithm to be instantly used. The smart agent will be able to efficiently find its path through a network that consists of curved and straight paths that links between destinations.

1. INTRODUCTION

Traditional software's technologies in the past decades have restrained the realism of the road system simulation. AI path finding algorithms avoids the use of curved paths and always tries to transform the space to grid space and perform path finding on a graph formed above the tile grid system[1][2][4].

Video games system --as an example of real time rendering software's, tries to minimize the path simulation calculations in order to reserves the CPU and memory resources for graphics calculations. For this reason we never see a road system that has real time smart agents moving along with a curved path. In fact, most of the Games in that has these roads networks such as *Cesar IV*, *CivCity Rome* and *SimCity* often restrict roads to horizontal, vertical and 45 degree diagonal straight roads[3].

Real time system avoid the usage of heavy calculative algorithms in simulation navigation through a graph network. Curves are often interpolated using segments of smaller straight lines that unites together to form a path. This will add to the complication of the path finding by adding many more expensive nodes to the graph. The portion of the code that will be made heavier while including a curved path is that portion that is constantly updated[1][5] (the graph structure). Our approach here is to minimize the graph structure so that the curved path will be viewed as a single path between nodes. This means that the graph structure wont have as many segments as in the traditional method, it will have one segment, regardless of its shape.

Path finding algorithms for curved path that are currently available are used in CAD systems in civil design [8] [12] and such, they are not real time based. The algorithms are not designed to be used continuously and repeatedly. The path finding designing software's are meant to be done once in a while, and for the CPU clock, --that has an average discrete simulation time step interval is around 10 ms, using any heavy algorithm once every 1 minute is virtually negligible.

Our goal here is to use interpolation algorithm to describe the curve instead of using multiple segments. The advantages of interpolation beside optimization, is that [7][9] it will be more precise to the actual curve than the finite array of straight segments. However, in order to integrate this interpolated graph into the path finding algorithm there are many considerations.