

**ADVANCES IN THE
ASTRONAUTICAL SCIENCES**

Volume 50 Part 2

***Engineering Sciences
and Mechanics***

Edited by

HAN-MIN HSIA

RICHARD W. LONGMAN

YOV-LI CHOU



ENGINEERING SCIENCE AND MECHANICS

VOLUME 50 PART II ADVANCES IN THE ASTRONAUTICAL SCIENCES

Edited by

Han-Min Hsia

Richard W. Longman

You-Li Chou

Proceedings of an international
symposium held December 29-31, 1981
in Tainan, Taiwan, under joint
sponsorship of the National Cheng
Kung University and the American
Astronautical Society

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Library of Congress Card No. 57-43769

ISSN 0065-3438

ISBN 0-87703-166-5 (PART I)

ISBN 0-87703-167-3 (PART II)

Distributed by UNIVELT, INC., P.O.Box 28130, San Diego, California 92128, USA, or by the National Cheng-Kung University, Tainan, Taiwan

Printed and Bound in Taiwan,

**ENGINEERING SCIENCE
AND MECHANICS**

NCKU/AAS 1981

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Author Index

- Balas M.J.,178,478
Banks H.T.,158
Bert C.W.,1239
Bock H.G.,949
- Chamis C.C.,1308
Chang C.,1499
Chang C.Y.,661,1389,1442,1465
Chang J.R.,276
Chang Y.M.,550,573
Chao C.C.,814
Chen C.C.,723
Chen C.K.,539,320,573
Chen C.N.,633
Chen H.S.,1477
Chen J.R.,1457
Chen K.H.,1487
Chen L.W.,746
Chen S.,620
Chen T.S.,647
Chen W.H.,710
Chen W.L.,77
Chen Y.C.,1381
Chen Y.C.,102
Chien L.C.,587
Chin H.,1215
Chin T.S.,1465
Chiu D.,35
Chou Y.L.,598
Chu H.S.,539
Chu H.Y.,647
Chun Y.W.,1254
Cleaver J.W.,573
Crowley J.M.,158
- Dasgupta A.,1254
Denn M.M.,294
Doong J.L.,746,1477
Doran A.L.,15
Dowell E.H.,760
- Equsa T.,609
- Fujii H.,409
Feng C.K.,562
Finzi A.E.,330
Fuh K.H.,1342
- Gavalas G.R.,303
Goel P.S.,1131
Gran R.,208
- Hablani H.B.,420
Hahn H.T.,1199
Han K.W.,196
Ho T.,1164
Hsia H.M.,236
Hsu W.C.,1389,1442
Huang C.L.,1513
Huang C.L.,647
Huang J.S.,694
Hughes P.C.,66
Hwang C.,88
Hwang D.G.,1199
Hwang W.M.,852
- Ikeda M.,51
- Jeng Y.N.,236,598
Johnson T.L.,1
Juang J.N.,383,1112
- Katzman M.,1012
Khanna R.,255
Kida T.,938
Kumar K.,451
Kumar M.,1239
Kung I.S.,587
Kuo C.H.,1457
Kuo M.T.,633
- Lavie R.,294
Lee S.L.,527
Lee Y.H.,661
Leitmann G.,141
Liao C.L.,620
Lin J.G.,973
Lin J.M.,196
Lin M.J.,917
Lin S.C.,1080
Lin S.H.,661
Lin T.C.,710
Lin Y.H.,1058
Liou M.S.,493
Liu J.J.F.,342

Liu W.C.,1389,1442
Longman R.W.,949,1091
Lu S.S.,400,470

McLaughlin P.V.Jr.,1254
Meirovitch L.,891
Melosh R.J.,671
Meng C.H.,77
Mingori D.L.,15
Münch R.E.,1151

Ohkami Y.,124,938
Okamoto O.,938
Omatu S.,111
Ouyang J.,478

Padhi A.K.,451
Perng M.H.,1428
Pilkey W.D.,875

Rajaram S.,1001,1131
Rao A.K.,1351
Ren S.,1080
Rosengren M.,368

Salamon N.J.,1228
Schapery R.A.,1164
Seinfeld J.H.,111,255
Shih Y.P.,88,276
Shiramatsu T.,1499
Siddoway M.,294
Siljak D.D.,51
Silverberg L.M.,891
Skelton R.E.,35
So H.,1278
Sun C.T.,723,1290

Tan T.M.,1290
Tang P.C.,400,470
Tarn J.Q.,1179
Tashiro S.,409
Tsai Y.L.,1513
Tzeng J.S.,1381,1499
Tzeng L.M.,661

Viswanathan C.N.,1091

Wang B.P.,875
Wang K.S.,800,832
Wang R.T.,832
Wang S.J.,383

Wang S.S.,1215
Wang T.S.,550
Wang Y.M.,1179
Wang Y.Z.,800
Wanh L.,814
Weeks C.,221
Wei C.C.,1513
Wei D.C.,1412
Wei S.E.,598
Weng C.I.,550,539,320
Wu A.Y.W.,1041
Wu C.Y.,320
Wu T.S.,1465,1499
Wu Y.C.,400,470
Wu Y.C.,1215

Yan H.S.,852
Yang J.N.,917
Yang R.J.,861
Yang S.W.,1525
Yeh F.S.,1457
Yeh M.Y.,276
Yeh S.N.,620
Yip M.C.,1428
Yong K.,1012

TABLE OF CONTENTS

SESSION 1: MEASUREMENTS AND CONTROLS IN PHYSICAL SYSTEMS

PRINCIPLES OF SENSOR AND ACTUATOR LOCATION IN DISTRIBUTED SYSTEMS,T.L.Johnson,Bolt Beranek and Newman Inc.,Cambridge,Massachusetts,U.S.A.	1
MODEL REDUCTION BY COST DECOMPOSITION:IMPLICATION OF COORDINATE SELECTION,D.L.Mingori and A.L.Doran,UCLA, Los Angeles,California,U.S.A.	15
SELECTING MEASUREMENT AND CONTROL IN LQG PROBLEMS, R.E.Skelton and Di Chiu,Purdue University,West Lafayette, Indiana,U.S.A.	35
ON OPTIMALITY OF DECENTRALIZED CONTROL WITH OVERLAPPING INFORMATION SETS,M.Ikeda,Kobe University, Nada,Kobe,Japan,and D.D.Siljak,University of Santa Clara, Santa Clara,California,U.S.A.	51
MODAL COST ANALYSIS AS AN AID IN CONTROL SYSTEM DESIGN FOR LARGE SPACE STRUCTURES,P.C.Hughes, University of Toronto,Toronto,Ontario,Canada.....	66
WALSH SERIES SOLUTION OF LINEAR SYSTEM WITH TIME VARYING DELAY,Wen-Liang Chen and Chia-Hsiang Meng,National Tsing Hua University,Taiwan,R.O.C.	77
OPTIMAL CONTROL OF DELAY SYSTEMS VIA BLOCK PULSE FUNCTIONS,Chyi Hwang and Yen-Ping Shih,National Cheng Kung University,Taiwan,R.O.C.	88
IDENTIFICATION OF A SYSTEM CONTAINING MULTI- VALUED NONLINEARITY,Yung-Chang Chen,National Central University,Taiwan,R.O.C.	102
ESTIMATION OF ATMOSPHERIC SPECIES CONCENTRATIONS FROM REMOTE SENSING DATA,S.Omatu,University of Tokushima, Tokushima,Japan,J.H.Seinfeld,California Institute of Technology,Pasadena,California,U.S.A.	111
DYNAMIC MOTION MEASUREMENTS OF A MAGNETICALLY SUSPENDED MOMENTUM WHEEL FOR SPACECRAFT ATTITUDE CONTROL,Y.Ohkami,National Aerospace Laboratory, Tokyo,Japan.....	124

SESSION 2: CONTROL OF LARGE SCALE AND DISTRIBUTED PARAMETER SYSTEMS

ON STABILIZING UNCERTAIN SYSTEMS,G.Leitmann, University of California,Berkeley,California,U.S.A.	141
PARAMETER ESTIMATION FOR DISTRIBUTED SYSTEMS ARISING IN ELASTICITY,H.T.Banks and J.M.Crowley,Brown University, Providence,Rhode Island,U.S.A.	158

FINITE DIMENSIONAL DISCRETE TIME CONTROL OF LINEAR DISTRIBUTED PARAMETER SYSTEMS,M.J.Balas,Rensselaer Polytechnic Institute,Troy,New York,U.S.A.	178
LIMIT CYCLE ANALYSIS OF CONTROL SYSTEM WITH COMPLEX NONLINEARITIES,Jium-Ming Lin and Kuang-wei Han, National Chiao Tung University,Taiwan,R.O.C.	196
CONTROL OF DISTRIBUTED HYPERBOLIC SYSTEMS:"WHAT DOES A TOKAMAK AND A LARGE SPACECRAFT HAVE IN COMMON?", R.Gran,Grumman Aerospace Corporation,Bethpage,New York, U.S.A.	208
STATIC SHAPE DETERMINATION AND CONTROL FOR A LARGE SPACE ANTENNA,C.Weeks,Princeton University, Princeton,New Jersey,U.S.A.	221
SESSION 3: CHEMICAL ENGINEERING SYSTEMS	
NUMERICAL ANALYSIS OF MOVING BOUNDARY PROBLEM IN MATRIX WITH A THIN ALTERNATE MATRIX,H.M.Hsia and Y.N.Jeng, National Cheng Kung University,Tainan,Taiwan,R.O.C.	236
MATHEMATICAL MODEL OF A FIXED BED,CATALYTIC METHANATION REACTOR,R.Khanna and J.H.Seinfeld,California Institute of Technology,Pasadena,California,U.S.A.	255
A MATHEMATICAL MODEL OF THE PHASE TRANSFER CATALYTIC PREPARATION OF BENZYL BENZOATE,Jen-Ray Chang,Mou-Yung Yeh, Yen-Ping Shih,National Cheng Kung University,Taiwan, R.O.C.	276
DYNAMICS OF PLANTS WITH RECYCLE,M.M.Denn and R.Lavie, University of California,Berkeley,California,U.S.A.	294
MULTIPHASE GASIFICATION REACTORS,G.R.Gavalas and M. Siddoway,California Institute of Technology,Pasadena, California,U.S.A.	303
ANALYSIS OF FREE COATING ONTO A ROTATING ROLL, Chih-Yang Wu,Cheng-I Weng, and Chao-Kuang Chen,National Cheng Kung University,Taiwan,R.O.C.	320
ON THE MINIMUM FUEL CONSUMPTION SWITCHING SURFACES, A.E.Finzi,Istituto di Ingegneria Aerospaziale, Politecnico di Milano,Milano,Italy.....	330
SESSION 4: AEROSPACE SCIENCE AND TECHNOLOGY	
ADVANCES IN THE MOTION OF AN ARTIFICIAL SATELLITE WITH DRAG,J.J.F.Liu,ADC/DOC,Peterson AFB,Colorado Springs, Colorado,U.S.A.	342
REQUIREMENTS ON THE REACTION CONTROL SUBSYSTEM FOR THE GIOTTO SPACECRAFT GENERATED FROM CONSIDERATION OF SPACECRAFT DYNAMICS,M.Rosengren,European Space Operations Centre,Darmstadt,West Germany.....	368

AN INVESTIGATION OF QUASI-INERTIAL ATTITUDE CONTROL FOR A SOLAR POWER SATELLITE, J.N.Juang, Martin Marietta Aerospace, Denver, Colorado and S.J.Wang, Jet Propulsion Laboratory, Pasadena, California, U.S.A.	383
A CASCADE NONLINEAR COMPENSATION OF THE THYRISTOR DUAL CONVERTER FOR DC MOTOR DRIVES, P.C.Tang, S.S.Lu, and Y.C.Wu, National Chiao Tung University, Taiwan, R.O.C.	400
EFFECT OF DEPLOYING ACCELERATION ON A FLEXIBLE ANTENNA OF A SPIN-SATELLITE, H.Fujii and Shinichi Tashiro, Tokyo Metropolitan College of Technology, Tokyo, Japan.....	409
DYNAMICS OF TISSERAND'S FRAME FOR AN ELASTIC SPACECRAFT WITH STORED ANGULAR MOMENTUM, Hari B.Habiani, NASA Johnson Space Center, Houston, Texas, U.S.A.	420
LATERAL DRIFT COMPENSATION FOR SATELLITES IN NON-EQUATORIAL SYNCHRONOUS ORBITS THROUGH ATTITUDE CONTROL, K.Kumar and A.K.Padhi, Indian Institute of Technology, Kanpur, India.....	451
MICROPROCESSOR-BASED DESIGN OF A FIRING CIRCUIT FOR THREE-PHASE FULL-WAVE THYRISTOR DUAL CONVERTER, P.C.Tang, S.S.Lu, and U.C.Wu, National Chiao Tung University, Taiwan, R.O.C.	470
SOLUTION METHODS FOR THE ENHANCED MODAL CONTROL RICCATI EQUATION, M.J.Balas and J.Ouyang, Rensselaer Polytechnic Institute, Troy, New York, U.S.A.	478
SOME RECENT PROGRESS IN THE ANALYSIS OF TRANSONIC INTERNAL FLOWS, Meng-Sing Liou, National Cheng Kung University, Taiwan, R.O.C.	493
SESSION 5: THERMODYNAMICS AND FLUID MECHANICS	
LIQUID METAL HEAT TRANSFER IN TURBULENT PIPE FLOW WITH UNIFORM WALL FLUX, Shong-Leih Lee, National Tsing Hua University, Taiwan, R.O.C.	527
TRANSIENT RESPONSE OF COMPOSITE STRAIGHT FIN, Hsin-Sen Chu, Cheng-I Weng, and Chao-Kuang Chen, National Cheng Kung University, Taiwan, R.O.C.	539
VARIATIONAL EMBEDDING SOLUTIONS OF RADIATIVE HEAT TRANSFER UPON A SEMI-INFINITE BODY WITH VARIABLE THERMAL PROPERTIES, Yih-Min Chang, Ting-San Wang, and Cheng-I Weng, National Cheng Kung University, Taiwan, R.O.C.	550
LOCAL SIMILARITY SOLUTION OF THE TRICOMI EQUATION IN THE ELLIPTIC COORDINATES, Chao-Kang Feng, Chung Cheng Institute of Technology, Taiwan, R.O.C.	562
VARIATIONAL EMBEDDING TECHNIQUE FOR HEAT CONDUCTION WITH PHASE CHANGE PROBLEMS, Yih-Min Chang, Chao-Kuang Chen, and John W.Cleaver, National Cheng Kung University, Taiwan, R.O.C.	573

HEAT TRANSFER IN UNSTEADY FLOW PAST A HEATED IMPULSIVELY STARTED CIRCULAR CYLINDER,Lai-Chen Chien and In-Shieh Kung,Institute of Physics, Academia Sinica,Taiwan,R.O.C.	587
A MEKSYN SERIES METHOD FOR THE FALKNER-SKAN EQUATION WITH MASS TRANSFER,You-Li Chou,Yih-Nen Jeng and Shing-Err Wei,National Cheng Kung University, Taiwan,R.O.C.	598
STAGNATION BOILING,Tatsuo Egusa,National Cheng Kung University,Taiwan,R.O.C.	609
SESSION 6: COMPUTER APPLICATIONS	
DEVELOPMENT OF A CONTROL SYSTEM FOR STRUCTURAL TEST WITH MINICOMPUTER,Sen Chen,Ching-Lung Liao and Sheng-Nian Yeh,National Taiwan Institute of Technology,Taiwan,R.O.C.	620
A SEMANTIC DESCRIPTION LANGUAGE AND ITS IMPLEMENTATION,C.N.Chen and M.T.Kuo,National Cheng Kung University,Taiwan,R.O.C.	633
THE PROTECTION AND CONTROL OF POWER FEEDER BASED ON MICROPROCESSOR,Tse-Sheng Chen,Ching-Lien Huang,and Huey-Yeong Chu,National Cheng Kung University,Taiwan, R.O.C.	647
A MICROCOMPUTER-CONTROLLED MOTORS INSPECTING SYSTEM,C.Y.Chang,L.M.Tzeng,Y.H.Lee,and S.H.Lin, National Cheng Kung University,Taiwan,R.O.C.	661
SESSION 7: STRUCTURAL DYNAMICS	
FINITE ELEMENT APPROXIMATIONS IN TRANSIENT ANALYSIS, R.J.Melosh,Duke University,Durham,North Carolina, U.S.A.	671
BUCKLING FINITE ELEMENT ANALYSIS OF FLAT PLATES WITH A RECTANGULAR HOLE,Jeng-Sheng Huang,Chung Yuan Christian University,Taiwan,R.O.C.	694
DYNAMIC ANALYSIS OF VISCOELASTIC STRUCTURES USING INCREMENTAL FINITE ELEMENT METHOD,Wen-Hwa Chen and Tsung-Chien Lin,National Tsing Hua University, Taiwan,R.O.C.	710
TRANSIENT ANALYSIS OF LARGE FRAME STRUCTURES BY SIMPLE MODELS,C.C.Chen,Bechtel Power Corporation, Norwalk,California,and C.T.Sun,Purdue University, West Lafayette,Indiana,U.S.A.	723
LARGE AMPLITUDE VIBRATION OF AN INITIALLY STRESSED THICK PLATE,Lien-Wen Chen and Ji-Liang Doong, National Cheng Kung University,Taiwan,R.O.C.	746

NONLINEAR AEROELASTICITY, E.H. Dowell, Princeton University, Princeton, New Jersey, U.S.A.	760
SENSITIVITY ANALYSIS OF A COMBINED BEAM-SPRING-MASS STRUCTURE, K.S. Wang and Y.Z. Wang, National Tsing Hua University, Taiwan, R.O.C.	800
OPTIMAL DESIGN AND AEROELASTIC INVESTIGATION OF SEGMENTED WINDMILL ROTOR BLADES, C.C. Chao and L. Wanh, National Tsing Hua University, Hsinchu, Taiwan, R.O.C.	814
SELF EXCITATION OF SUBHARMONIC OF ORTHOTROPIC PLATE WITH INITIAL IMPERFECTION, R.T. Wang and K.S. Wang, National Cheng Kung University, Taiwan, R.O.C.	832
AN APPROACH FOR THE GENERATION OF KINEMATIC CHAINS WITH MULTIPLE JOINTS, Hong-Sen Yan and Wen-Miin Hwang, National Cheng Kung University, Taiwan, R.O.C.	852
STEADY MOTION OF A THREAD OVER A ROTATING ROLLER, Ruey-Jen Yang, University of California, Berkeley, California, U.S.A.	861
REANALYSIS AND DESIGN IN STRUCTURAL DYNAMICS, B.P. Wang and W.D. Pilkey, University of Virginia, Charlottesville, Virginia, U.S.A.	875
SESSION 8: DYNAMICS AND CONTROL OF MECHANICAL AND CIVIL ENGINEERING SYSTEMS	
CONTROL OF STRUCTURES SUBJECTED TO SEISMIC EXCITATION, L. Meirovitch and Lawrence M. Silverberg, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A.	891
CONTROL OF BUILDINGS UNDER EARTHQUAKE USING ACTIVE MASS DAMPER, J.N. Yang and M.J. Lin, The George Washington University, Washington, D.C., U.S.A.	917
ON MODERN MODAL CONTROLLER FOR FLEXIBLE SPACE STRUCTURES, T. Kida, O. Okamoto and U. Ohkami, National Aerospace Laboratory, Tokyo, Japan.	938
COMPUTATION OF OPTIMAL CONTROLS ON DISJOINT CONTROL SETS FOR MINIMUM ENERGY SUBWAY OPERATION, Hans Georg Bock, Universität Bonn, West Germany and R.W. Longman, Columbia University, New York, U.S.A.	949
GENERAL CONDITIONS ON REDUCED-ORDER CONTROL FOR ENSURING FULL-ORDER CLOSED-LOOP ASYMPTOTIC STABILITY, J.G. Lin, The Charles Stark Draper Laboratory, Cambridge, Massachusetts, U.S.A.	973
OPTIMAL INDEPENDENT MODAL SPACE CONTROL OF A FLEXIBLE SYSTEM INCLUDING INTEGRAL FEEDBACK, S. Rajaram, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A.	1001

TECHNOLOGICAL ISSUES IN COMMUNICATION AND CONTROL OF OPTICAL SYSTEMS FOR SPACE APPLICATION, M. Katzman and K. Yong, The Aerospace Corporation, El Segundo, California, U.S.A.	1012
STATE ESTIMATION/PARAMETER IDENTIFICATION- GUARANTEED ERROR APPROACH, A. Y. W. Wu, Hughes Aircraft Company, Culver City, California, U.S.A.	1041
PERFORMANCE OF A RANDOM ACCESS PACKET NETWORK WITH TIME-CAPTURE CAPABILITY, Y. H. Lin, Jet Propulsion Laboratory, Pasadena, California, U.S.A.	1058
AN ANALYTICAL DESIGN OF ELECTROHYDRAULIC POSITION SERVO SYSTEMS WITH VARIABLE STRUCTURE, Shih-Chang Lin and Shouh Ren, National Tsing Hua University, Taiwan, R.O.C.	1080
THE DETERMINATION OF THE DEGREE OF CONTROLLAB- ILITY FOR DYNAMIC SYSTEMS WITH REPEATED EIGENVALUES, C. N. Viswanathan, RCA Astro-Electronics, Princeton, N.J., U.S.A. and R. W. Longman, Columbia University, New York, U.S.A.	1091
FIRST ORDER SOLUTION OF THE OPTIMAL CONTROL PROBLEM FOR DISTRIBUTED PARAMETER ELASTIC SYSTEM, J. N. Juang, Martin Marietta Aerospace, Denver, Colorado, U.S.A.	1112
NOVEL MAGNETIC TORQUING SCHEME FOR SATELLITE ATTITUDE CONTROL, S. Rajaram, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A. and P. S. Goel, ISRO Satellite Center, India.	1131
OPERATIONAL ASPECTS OF THE INJECTION OF SPACECRAFT INTO GEOSTATIONARY ORBIT, R. E. Münch, European Space Operations Centre, Darmstadt, West Germany.	1151
SESSION 9: COMPOSITES	
VISCOELASTIC BEHAVIOR OF AS/3501-6 GRAPHITE/EPOXY COMPOSITE, T. Ho, Vought Corporation, Dallas, Texas, R.A. Schapery, Texas A & M University, College Station, Texas, U.S.A.	1164
A DIFFERENTIAL SCHEME FOR MULTIPHASE COMPOSITES, Jiann-Quo Tarn and Yung-Ming Wang, National Cheng Kung University, R.O.C.	1179
RESIDUAL STRESSES AND THEIR EFFECTS IN COMPOSITE LAMINATES, H. T. Hahn and D. G. Hwang, Washington University, St. Louis, Missouri, U.S.A.	1199
DESIGN FABRICATION AND TEST OF A COMPOSITE ELEVATOR, Shih-Sen Wang, Hsiang Chin, and Yii-Cheng Wu, Aeronautical Research Laboratory, Taichung, Taiwan, R.O.C.	1215

PECULIARITIES IN STRESS SOLUTIONS IN LAMINATED COMPOSITES,N.J.Salamon,West Virginia University, Morgantown,West Virginia,U.S.A.	1228
EXPERIMENTS ON HIGHLY-NONLINEAR ELASTIC COMPOSITES,C.W.Bert and M.Kumar,The University of Oklahoma,Norman,Oklahoma,U.S.A.	1239
BILINEAR FAILURE ANALYSIS OF FIBER COMPOSITE LAMINATES,P.V.Mclaughlin Jr.,A.Dasgupta, and Y.W.Chun, Villanova University,Villanova,Pennsylvania,U.S.A.	1254
CONTACT PRESSURE AND INTERFACIAL STRESSES IN LAYERED CYLINDERS,Hon So,National Chiao Tung University,Taiwan,R.O.C.	1278
WAVE PROPAGATION IN A GRAPHITE/EPOXY LAMINATE, C.T.Sun and T.M.Tan,Purdue University,West Lafayette, Indiana,U.S.A.	1290
DESIGNING WITH FIBER REINFORCED PLASTICS,C.C.Chamis, Composites Specialist,Cleveland,U.S.A.	1308
THE EFFECTS OF CUT AND EDGE ON THE ULTIMATE TENSILE STRENGTH OF PLANAR RANDOMLY-DISTRIBUTED SHORT FIBER COMPOSITES,Kuang Hua Fuh,Tatung Institute of Technology,Taiwan,R.O.C.	1342
PIN JOINTS IN COMPOSITES,A.K.Rao,Indian Institute of Science,Bangalore,India.....	1351
SESSION 10: TOPICS IN MATERIALS	
SYNTHESIZATION AND PROPERTIES OF SOLID ELECTROLYTE $\text{Ag}_{26}\text{I}_{18}\text{W}_4\text{O}_{16}$, Y.C.Chen and J.S.Tzeng, National Cheng Kung University,Taiwan,R.O.C.	1381
A NEW TECHNIQUE FOR HIGH VOLTAGE POWER TRANSISTOR,Wen-Chau Liu,Chun-Yen Chang,and Wei-Chou Hsu, National Cheng Kung University,Taiwan,R.O.C.	1389
EFFECTS OF HAZ SIZE AND HARDNESS VARIATION ON THE PERFORMANCE OF DC FLASH WELDS,D.C.Wei, Kelsey-Hayes Company,Ann Arbor,Michigan,U.S.A.	1412
UNIAXIAL AND BIAXIAL TRANSIENT CREEP BEHAVIOR OF ALUMINUM ALLOY,Ming Chuen Yip and Ming Hwei Perng, National Tsing Hua University,Taiwan,R.O.C.	1428
DEEP LEVEL TRANSIENT SPECTROSCOPIC STUDY ON A-SI-H THIN FILM DEVICES,Wei-Chou Hsu,Chun-Yen Chang,and Wen-Chau Liu,National Cheng Kung University,Taiwan, R.O.C.	1442
A CALORIMETRIC INVESTIGATION OF A $\text{MNO} \cdot \text{AL}_2\text{O}_3 \cdot \text{SIO}_2$ GLASS,F.S.Yeh,C.H.Kuo,and J.R.Chen,National Tsing Hua University,Taiwan,R.O.C.	1457

A STUDY ON MICROSTRUCTURE AND MAGNETIC PROPERTIES OF Fe-Cr-Co-M PERMANENT MAGNET ALLOYS,T.S.Chin,T.S.Wu,C.Y.Chang,National Cheng Kung University,Taiwan,R.O.C.	1465
INFLUENCE OF PRECRACKED LOAD ON CRITICAL STRESS INTENSITY FACTOR OF MILD STEEL,Hsing-Shih Chen and Ji-Liang Doong,National Cheng Kung University,Taiwan, R.O.C.	1477
MICROSTRUCTURE AND PROPERTIES OF INJECTION MOLDED CONDUCTIVE PLASTICS,Kuo-Hua Chen,Chung Shan Institute of Science and Technology,Taiwan,R.O.C.	1487
A STUDY OF PLASTIC THERMISTOR,Chia Chang,Tien-Shou Wu,Jih-Shaw Tzeng,and Toyotaro Shiramatsu,National Cheng Kung University,Taiwan,R.O.C.	1499
PREPARATION AND CHARACTERISTICS OF ZNO VARISTORS,C.C.Wei,Y.L.Tsai and C.L.Huang,National Cheng Kung University,Taiwan,R.O.C.	1513
NI-BASE MC-CARBIDE REINFORCED EUTECTIC ALLOYS FOR JET ENGINEERING APPLICATION,S.W.Yang,General Electric CO.,Corporate R&D,Schenectady,New York,U.S.A.	1525

Proceedings of NCKU/AAS International Symposium
on Engineering Sciences and Mechanics

FINITE ELEMENT APPROXIMATIONS
IN TRANSIENT ANALYSIS

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In developing his model of a flexible structure, the finite element analyst indirectly establishes the spatial discretization error and computer resources necessary for particularizing the reduced equations of motion.

This paper presents the results of a study of the accuracy-computer-resources relation as a function of modeling parameters. It defines the modeling problem, reviews the state-of-the-art of modeling, explains the effects of modeling parameters, and examines optimum modeling.

The illustrative modeling parameter study centers on modeling for the analysis of a beam representation of an airplane body. The report displays the relation between accuracy and the number of nodes for various stiffness and mass models and for the full spectrum of nodal arrangements. Evaluations of the Rayleigh Quotient, using exact modal shapes, furnish measures of errors in the eigenvalues. Comparison with the number of calculations for exact analysis characterize the relative computer resources involved using different models (as well as the inefficiency of finite element modeling).

Conclusions confirm the desirability of using special purpose dynamic models.

Work supporting this paper was sponsored, in part, by the National Aeronautics and Space Administration under a grant from Langley Research Center. Dr. Robert Hayduk, a Senior Research Engineer in the Structural Dynamics Section stimulated this particular study.