

## EDUCATION

- ❑ **Ph.D.** Aerospace Engineering, **Aircraft Dynamics and Controls**, Auburn University, AL. (June 95)  
**Dissertation: Design of Control System using Variable Structure System**
- ❑ **M.S.** Aerospace Engineering, **Aircraft Dynamics and Controls**, Auburn University, AL. (May 91)  
**Thesis: Criteria for Lateral Handling Qualities Evaluation**
- ❑ **B.Tech.** Aeronautical Engineering, Indian Institute of Technology (IIT), India. (June 86)  
**Senior Project: Design and Fabrication of RPV (Remotely Piloted Vehicle)**

## TECHNICAL EXPERIENCE

### Consultant to ROCHE DIAGNOSTICS, INDIANAPOLIS (Jan 2008-present)

- ❑ Develop and asses physiological model
- ❑ Design & analyze in-silico simulation lifestyle and therapy impact on physiological outcomes

### Consultant to DISETRONIC MEDICAL SYSTEMS AG, BURGDORF, SWITZERLAND (2+ yr)

- ❑ Patient modeling, simulation, controller design and IP associated work

### DISETRONIC MEDICAL SYSTEMS AG, BURGDORF, SWITZERLAND (1.25 yr)

- ❑ Patient modeling, simulation, controller design and IP associated work

### Consultant to ROCHE DIAGNOSTICS, INDIANAPOLIS (1 yr)

- ❑ Reformulating Empirical Algorithm to Model Predictive Controller
- ❑ Documentation of various application/tool developed by myself

### SYSTEM DESIGN GROUP, INDIANAPOLIS, INDIANA (9 m)

- ❑ Programming using Delphi. Verification and Validation, serial port communication, software management, OOP.

### UNITED KALINGA, BOSTON, MASSACHUSSETS (1 yr)

- ❑ Developing and implementing call flow for Brooktrout TR-114 & TR-1000 system, telephony system
- ❑ Managed team of software engineers to integrate telephony system with database and work with a distributed system
- ❑ VB to provide MS-Office solutions (Automation) – using ActiveX components and COM objects

### ROCHE DIAGNOSTIC, R & D, INDIANAPOLIS, INDIANA (3 yr)

- ❑ Developing sensor specifications
- ❑ Mathematical modeling of diabetic patient, open loop and closed loop simulation, data analysis
- ❑ Design and implement of MPC controller for glucose control in Type-I diabetic patient, implementation of intensive insulin therapy
- ❑ Software development, Matlab/Simulink, C
- ❑ VB to provide data across applications

### ARMSTRONG LABORATORIES, DEPARTMENT OF THE AIR FORCE HEADQUARTERS HUMANS SYSTEMS CENTER (3 m)

- ❑ Evaluation of Above Real Time Training & Self Instructional Strategies for Airmanship Tasks on an A-10 Flight Simulator

### THE BOEING CO.(6 m)

- ❑ Design of control system for inherently unstable vertical pendulum

### WRIGHT LABS/ARMAMENT DIRECTORATE, EGLIN, FLORIDA (3 yr)

- ❑ Evaluation and implementation of variable structure control for missile autopilots using reaction jets and aerodynamic control
- ❑ Digital modeling and simulation of the missile and control system



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- ❑ Used TRAP (TRajjectory Analysis Program) an analytical tool to evaluate and predict the design and performance of aerodynamic vehicles in 1-on-1 engagement scenarios
- ❑ Used Missile DATCOM for generating stability coefficients data for missile  
*HAYES TARGETS, LEEDS, ALABAMA (2 yr)*
- ❑ Analysis and Design of digital autopilot for stabilizing and maneuvering a towed missile (TRX-12)
- ❑ Dynamic stability analysis of TRX-12 for various towing points
- ❑ Implemented and tested control related codes  
*NATIONAL AERONAUTICAL LABORATORY, INDIA (3 m)*
- ❑ Developed computer codes for compressible flow analysis over slender bodies

## TEACHING EXPERIENCE

### ASSISTANT PROFESSOR, DEPT. OF MECHANICAL ENGG., TUSKEGEE UNIVERSITY, AL(2+ yr)

- ❑ Junior and senior level classes: Strength of Materials, Dynamics, Controls, Theory of Machines, AUTOCAD, Fluid Dynamics
- ❑ Graduate level class: Structural Vibrations

### GRADUATE TEACHING ASSISTANT, DEPT. OF AEROSPACE ENGG., AUBURN UNIVERSITY, AL

- ❑ Junior and senior level classes: Analysis and Design of Control systems , Aircraft Dynamics, Design of Autopilots for Aircraft and Missiles, MATLAB

## COMPUTER SKILLS

### Operating Systems

- ❑ Win95/NT/2000/XP, MacIntosh, Unix/Sunview/OpenWindows, Linux 7.2/9.1

### Software

- ❑ Control software design packages : **MATLAB**, **SIMULINK**, Boeing's EASY5W (Engineering Analysis System), AutoCAD, MATRIX-X, ACSL, Database MS Access, PostgreSQL

### Languages

- ❑ **FORTRAN**, **Visual C/C++**, **Visual Basic**, **Delphi**

## TECHNICAL EXPERTISE

- ❑ Software development
- ❑ Modeling physiological systems
- ❑ Aircraft Dynamics & Stability Analysis (Modeling and Simulation of rigid bodies)
- ❑ Non-linear Control System Design
- ❑ Vibrations of Mechanical Systems
- ❑ Analog & Digital Controls (Regulators, Servos, PID controllers, Bode plots, Root Locus)
- ❑ Modern Control Methods (Pole Placement, Model Following, Command Tracking, Model Predictive Controller)
- ❑ Programmable Controllers (PLC)
- ❑ Optimal Control Design (LQG, LQR, Kalman Filtering)
- ❑ Discrete Signal Processing (FIR, IIR)
- ❑ Flying Qualities of an Aircraft [Acquainted with MIL-F-8785C and the MIL-1797 (MIL Standard Handbook - Flying Qualities of Air Vehicles, Vol. 1 and Vol. 2)]

## AFFILIATIONS & HONORS

- ❑ American Institute of Aeronautics and Astronautics, member
- ❑ Outstanding Graduate Student Award (Auburn University, 90-91)
- ❑ Outstanding Graduate Student Award (Auburn University, 92-93)
- ❑ Outstanding Graduate Student Award (Auburn University, 94-95)
- ❑ STAR (Success Through Achievement and Recognition) Award, Roche Diagnostics, 2000

**PUBLICATIONS**

1. Innocenti, M., Thukral, A. "Robustness of a Variable Structure Control System for Maneuverable Flight Vehicles," *AIAA Journal of Guidance, Control and Dynamics*, March-April 1997
2. Innocenti, M., Thukral, A. "A Blending Strategy of Missile Autopilots using the Simplex Method," *Proceedings of the American Control Conference*, Seattle, WA, June 1995
3. Innocenti, M., Thukral, A. "Variable Structure Autopilot for High Angle of Attack Maneuvers Using On-Off Thrusters," *33<sup>rd</sup> Control and Decision Conference*, Orlando, February 1994
4. Thukral, A., Innocenti, M., "Missile Pitch Autopilot Synthesis for High Angle of Attack Maneuvering," (to be published) *IEEE Transactions on Control Systems Technology*, May 1994
5. Thukral, A., Innocenti, M. "Uses of VSS for Autopilot Design of Nonlinear Flight Vehicles," *Proceedings of the 3rd Workshop on Robust Control via Variable Structure and Lyapunov Techniques*, Benevento, Italy, September 1994
6. Thukral, A., Innocenti, M., "Controls Design Challenge: A Variable Structure Approach," *Journal of Guidance, Control and Dynamics*, Sept.-Oct. 1994
7. Thukral, A., Cochran Jr., J.E., Innocenti, M., "Evaluation of Variable Structure Control for Missile Autopilots using Reaction Jets and Aerodynamic Control," Research Development Laboratories, Culver City, California, RDL-93-132, May 15, 1994
8. Innocenti, M., Thukral, A., "Simultaneous Reaction Jet & Aerodynamic Control of Missile Systems," *AIAA Guidance, Navigation and Control Conference*, Aug. 9-11, 1993
9. Cochran Jr., J.E., Innocenti, M., No, T.S., Thukral, A., "Dynamics and Control of Maneuverable Towed Flight Vehicles," *Journal of Guidance, Control and Dynamics*, Sept.-Oct. 1992
10. Thukral, A., Innocenti, M., "Roll Metrics for Handling Qualities: The Landing Approach," *Journal of Guidance, Control and Dynamics*, Sept.-Oct. 1992
11. Innocenti, M., Thukral, A., "Roll Performance Criteria for Highly Augmented Aircraft," *Journal of Guidance, Control and Dynamics*, Nov.-Dec., 1991
12. Cochran Jr., J.E., Thukral, A., "Effect of Tow Cable Attachment Point Location on Tow Target Longitudinal Stability," Interim Report, Aerospace Engineering Department, Auburn University, AL., Aug. 31, 1990
13. Cochran Jr., J.E., Innocenti, M., No, T.S., Thukral, A., "Dynamics and Control of Maneuverable Towed Flight Vehicles," *AIAA Atmospheric Flight Mechanics Conference*, Portland, Oregon, August, 1990
14. Thukral, A., Innocenti, M., "LATHOS - Landing Data Analysis for Roll Criteria using Gibson's Method," Workshop on Handling Qualities Research and Application, *AIAA Atmospheric Flight Mechanics Conference*, Portland, Oregon, August, 1990
15. Cochran Jr., J.E., Innocenti, M., No, T.S., Thukral, A., "Six Degree of Freedom and Performance Analysis for the TRX-12 Tow Target," Vol. II, Aerospace Engineering Department, Auburn University, AL, March 22, 1990
16. Innocenti, M., Thukral, A., "Roll Response Criteria for High Maneuverable Aircraft using Gibson's Method," AIAA-89-3391, *AIAA Atmospheric Flight Mechanics Conference*, Boston, MA, August, 1989

**POSTERS**

1. Paul Galley; Robin Wagner; Harvey Buck, Stefan Weinert; Steven Bousamra; James Long; Ajay Thukral; David Kenyon; Guido Freckmann; Nina Jendrike; Cornelia Haug; Annette Abicht; "Use of subcutaneous continuous glucose measurements to drive real-time algorithm-directed insulin infusion recommendations," Diabetes Technology & Therapeutics, Volume 6, Number 2, 2004
2. Ajay Thukral; Paul Galley; Stefan Weinert, Thomas Vering; "Conversion of an empirical closed loop algorithm into the MPC framework," Diabetes Technology & Therapeutics, Volume 6, Number 2, 2004.

## PATENTS/APPLICATIONS

1. 20090326357; **Weinert; Stefan;** (Pendleton, IN) ; **Thukral; Ajay;** (Indianapolis, IN); *Method, system, and computer program product for calculating daily weighted averages of glucose measurements (or derived quantities) with time-based weights*
2. 20090006133; **Weinert; Stefan;** (Pendleton, IN) ; **Thukral; Ajay;** (Indianapolis, IN); *Patient information input interface for a therapy system*
3. 20090006129; **Thukral; Ajay;** (Indianapolis, IN) ; **Galley; Paul;** (Cumberland, IN) ; **Chittajallu; Siva;** (Indianapolis, IN) ; **Weinert; Stefan;** (Pendleton, IN); *Medical diagnosis, therapy, and prognosis System for invoked events and methods thereof*
4. 20090006061; **Thukral; Ajay;** (Indianapolis, IN) ; **Galley; Paul;** (Cumberland, IN) ; **Chittajallu; Siva;** (Indianapolis, IN) ; **Weinert; Stefan;** (Pendleton, IN); *System for developing patient specific therapies based on dynamic modeling of patient physiology and method thereof*
5. 20090005728; **Weinert; Stefan;** (Pendleton, IN) ; **Thukral; Ajay;** (Indianapolis, IN) ; **Galley; Paul;** (Cumberland, IN) ; **Chittajallu; Siva;** (Indianapolis, IN) ; **Bousamra; Steven;** (Carmel, IN) ; **Long; James;** (Fishers, IN); *Therapy delivery system having an open architecture and a method thereof*
6. 20070179434; **Weinert; Stefan;** (Pendleton, IN) ; **Galley; Paul;** (Cumberland, IN) ; **Thukral; Ajay;** (Indianapolis, IN) ; **Chittajallu; Siva;** (Indianapolis, IN) ; **Buck; Harvey;** (Indianapolis, IN) ; **Wagner; Robin;** (Fishers, IN) ; **Marco; Kym;** (Indianapolis, IN) ; **Long; James R.;** (Fishers, IN) ; **Bousamra; Stefan;** (Carmel, IN); *System and method for determining drug administration information*
7. 20060276771; **Galley; Paul J.;** (Cumberland, IN) ; **Thukral; Ajay;** (Indianapolis, IN) ; **Chittajallu; Siva;** (Indianapolis, IN) ; **Wagner; Robin;** (Fishers, IN) ; **Weinert; Stefan;** (Pendleton, IN) ; **Bousamra; Steven A.;** (Carmel, IN); *System and method providing for user intervention in a diabetes control arrangement*



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8. 20030028089; **Galley, Paul J.**; (*Indianapolis, IN*) ; **Thukral, Ajay**; (*Indianapolis, IN*) ; **Chittajallu, Siva K.**; (*Indianapolis, IN*) ; **Weinert, Stefan**; (*Pendleton, IN*); *Diabetes management system*