

Hrishik Mishra

Master Student at DLR

hrishikmishra@yahoo.com

Summary

Optimal estimation: Developing real-time estimators (observers) for Robot motion (position/orientation) parameters.

Control System: Developing vision-based control systems for Robots.

Pursuing Master thesis at Institute of Robotics and Mechatronics at DLR (German Aerospace) in the DEOS project in the field of optimal state (motion/inertial) estimation for uncooperative targets using vision-based system. Developing image-based visual-servoing system for DEOS using observer-based systems. Academic degrees in Electrical-and-Electronics engineering and Earth-Oriented-Space-Science-and-Technology.

Special skills: Optimal estimation with delayed-measurement updates, out-of-sequence measurements, event-driven measurement systems (vision), constrained estimation, multi-rate and multi-modal implementations, and Stochastic cloning estimation. MATLAB/Simulink toolboxes: SimEvents, Stateflow, Computer Vision, Machine Learning, Control Systems. Robotic systems prototyping using V-REP. Proficient in programming languages: C++, JAVA, C# and C. Nonlinear analysis.

Experience

Master Student at DLR

May 2016 - Present (3 months)

Development a real-time estimator (observer) system for motion-parameters (position/orientation) of an uncooperative target using vision-based system for visual-servo control:

Addressing problems related to out-of-sequence (time-delayed) measurements coming from vision-based systems, multi-rate estimator implementation, outlier-detection and rejection using estimator framework and event-driven estimator implementation using SimEvents, Stateflow toolboxes in Simulink for real time implementation on DEOS-SIM hardware.

Developed a Client-Server integration of V-REP and Simulink to simulate the entire visual-servo system using DEOS-SIM CAD models for visual emulation.

Student Worker at DLR

August 2015 - March 2016 (8 months)

Development a real-time estimator (observer) system for motion-parameters (position/orientation{quaternion}) of an uncooperative target using vision-based system for visual-servo control: Nonlinear observability analysis of 23-state system.

Developed simulations on MATLAB based on literature research and implemented the real-time system using Simulink.

States estimated: position, orientation, inertia ratios, target's geometry.

Student Worker at Institute for Astronomical and Physical Geodesy

October 2014 - June 2015 (9 months)

Migrating a C++ based Orbit integrator software from the existing Borland (Embarcadero) system to a Visual C++ system.

*System was highly coupled and a separation of the background logic from the UI components had to be done while migrating to a new syntactical environment.

Senior Engineer at Robert Bosch Engineering and Business So

January 2013 - March 2014 (1 year 3 months)

Software development for the Bluetooth connection module in the Fun2Drive (Android) application. Solving existing connection problems due to Android-bluetooth framework.

Software development for diesel fuel pump/injector diagnostic PC-based application for EPSxxx (EPS708, EPS815, EPS200) series. Solid understanding of different sensors used in diesel test bench measurement and diesel engine fuel delivery mechanisms.

All work for the project was supported in India by me.

Senior Engineer at Robert Bosch Engineering and Business Solutions Ltd.

May 2012 - March 2014 (1 year 11 months)

Automotive diagnostics (PC-based solution) for automotive engines, FSA 7xx and FSA 5xx.

Expertise .NET framework development using C#.

Research based activity - Estimation of longitudinal velocity of a car using GPS/INS integration on a smart-phone. Allan variance study to model sensor error characteristics like static bias, bias and random walk. The postulated idea was successfully implemented (Android) and tested on an actual vehicle. The activity was pursued further to estimate side slip conditions during vehicular cornering.

Systems Engineer at Infosys

January 2011 - June 2012 (1 year 6 months)

Technology:Java J2EE,IBM DB2

Domain:Prepaid card business through web channel for American Express Company

Processes:Risk assessment,Authorization and capture of payment,Fulfillment of orders,Reconciliation and settlement,Reload on prepaid cards,Production cycle for supporting enterprise applications.

*Solved existing problem of multiple orders being serviced (monetary loss to AMEX) due to overlapping schedulers using temporary tables.

Systems trainee at Infosys

July 2010 - January 2011 (7 months)

Extensive training in .NET framework, Database design and development and Systems programming.

*Established among Top 10% of performers in a batch of 1600 trainees with a CGPA of 4.98 on a scale of 5 in the intensive and rigorous training program.

•Infosys Certified Dot.NET Developer with authorization to code projects in Dot.NET as a Software Engineer.

Intern at National Instruments

May 2009 - June 2009 (2 months)

Designed a Rapid-prototyping LabVIEW model of an Internal Combustion engine (Spark ignition, single cylinder 2-stroke) using a mean value approach and simulated parameters: pedal position, throttle position, manifold airflow, fuel injection pulse width, spark advance values for Hardware-in-loop development.

Courses completed:

NI LabVIEW Basics I and II for development

NI Compact Reconfigurable Input and Output[CRIO] platform

Test Scores

ETS GRE

February 2014 Score:315

Quantitative: 163 Verbal: 152 Analytic writing: 4.0

TOEFL

February 2014 Score:116

116/120 in TOEFL iBT.

Reading: 29

Speaking: 29

Writing: 29

Listening: 29

Patents

A method and apparatus for audio engineering using Augmented Reality

India Patent Application *Unknown*

Inventors: Hrishik Mishra

*At present, the patent is still under department evaluation.

In many cases, especially in live concerts, it is needed for the sound engineer to be physically present on the stage along with the musicians to get the desired output on the monitors as well as the main amplifiers. It is also possible that sound engineer would like to compare the audio parameters from different places in the auditorium. But currently there is no easy solution for the same.

In general Sound Engineer will analyze and control audio signal from a single instrument or multiple combination of instruments. There is currently no easy solution to switch focus between music instruments.

A potential solution for this predicament draws from augmented reality, which has found its usage in a plethora of applications in engineering, academic learning, medicine etc.

Augmented reality enables the user to be mobile while still being in the field of contextual information and analysis.

A solution can be provided for audio engineers which will not only grant them mobility and participation in the creative process but also give them a full scale integration of existing audio technology, both software and hardware.

This solution shall help the audio engineer's user experience in following aspects :

Mixing process(stage/studio)

Audio/MIDI monitoring(stage)

Mastering(studio)

Audio analysis(FFT, time-domain)

Metering

Projects

Integration of V-REP with Simulink

June 2016 to Present

Members:Hrishik Mishra

Client-server integration of V-REP with Simulink to pass control/vision data between two software product for Software-in-loop tests with existing EKF model.

-Developed a System Object in Matlab which integrates with Simulink and connects to V-REP using existing remoteAPI.

-synchronous data transfer.

Generic Android based MIDI controller for MIDI devices

March 2013 to Present

Members: Hrishik Mishra, Bhupen Chauhan,

MIDI (Musical Instrument Digital Interface) is a data protocol for musical instruments to communicate. (eg. note number, velocity hit). Most music equipment today, are built up with support for MIDI channels to control parameters like volume, filter cut-off etc. The idea of this independent project was to make available a generic controller on an Android device which could be any mobile platform, smartphone, tablet or a phablet. With an assortment of intuitive User interface controls, sensor based controls, LFO (low frequency oscillator) and recorded automation patterns in the product, the musician has an array of control options to exploit during live performances.

Using UI elements like an XY controller, the musician can command two parameters to change simultaneously, providing him with 2-degrees of freedom. Sensors like proximity, accelerometers, gyroscopes inside a smart device can help the musician communicate with a MIDI device using hand gestures and body motions which makes music performances more intrusive and indulging over traditional knob and fader controls. LFOs and recorded automation patterns provide the user with a large bouquet of options to choose controls from, thereby adding dynamism to live performances.

At present stage, the XY pad controller has been logically finished and control messages like synth volume, cut-off frequency etc can be passed on to a MIDI enabled synthesizer. The MIDI-Android driver was written over USB link to make communications possible. MIDI I/O is feasible using the driver but MIDI input has not been used thus far.

Courses

Independent Coursework

Fundamentals of Audio and Music Engineering: Part 1
Musical Sound & Electronics

Honors and Awards

One time achievement award

Robert Bosch Engineering and Business solutions.

December 2012

The award was granted to place on record the contribution in :

- *Proposing an algorithm to estimate velocity of vehicle using a Smart phone.
- *Extensive study on Kalman filters and inertial navigation systems for the purpose of developing the algorithm.
- *The application shall be reused in another Bosch signature Android based application.

It was cash reward of Rs 10,000/-.

First prize for an engineering application in professional track

Trelleborg Sealing Solutions

July 2014

Trelleborg-Appstars was an engineering application competition organized by Trelleborg Sealing Solutions and Silicon India. As an entry, I had assisted in developing an Android-based MIDI controller which allowed a musician to use an Android-device to control synthesizer parameters like volume, cut-off etc. Specifically, I contributed in developing the USB-MIDI driver over the Android-USB infrastructure. We won the first prize for the entire event which was organized at a national level.

Skills & Expertise

Robotics

State Estimation

Control Systems Design

Navigation Systems

Visual Navigation

Programming

Software in loop

Sensors

Statistical Modeling

Rapid Prototyping

Kalman filtering

Space Systems

Certifications

Microsoft Certified Technology Specialist[MCTS] for Database development using SQL Server 2008

Microsoft License D585-4993 December 2011

Education

Technische Universität München

Master of Science (M.Sc.), Earth Oriented Space Science and Technology (ESPACE), 2014 - 2016

Activities and Societies: 2nd semester: Seminar on Robonaut's tendon-based hand control systems. Group

Project on estimation of Mean Sea Level using Level-2 JASON-1 and ENVISAT data.

Silicon Institute of technology

Bachelor of technology, Electrical and electronics, 2006 - 2010

Grade: 8.7 C.G.P.A

Activities and Societies: Founding member of IEEE chapter at university. Robotics study(joystick-based control of synchronous-drive system).

B.J.B Junior College

Higher Secondary certificate, Science, 2003 - 2005

Grade: 90.6

St. Xavier's High school

Matriculation certificate, 1998 - 2003

Grade: 90.6

Interests

Control system engineering, sensor technology, automotive (motor-racing) electronics, signal processing, engineering software, audio engineering, inertial navigation systems, state estimation, music synthesis using subtractive and additive methods

Hrishik Mishra

Master Student at DLR

hrishikmishra@yahoo.com



2 people have recommended Hrishik

"Hrishik Mishra is a good engineer with a great passion for building innovative systems. He is very systematic in his engineering approach. His scientific temperament is clearly visible with the way he executes an engineering task. His core strengths are signal processing, control engineering, sensor fusion techniques, Kalman filtering, 3D orientation detection and android development. He keeps himself updated about latest happenings in technology and engineering space. He is also a quick learner. He has built quality engineering software modules in the domain of vehicle diagnostic systems. His independent work in developing a sensor fusion algorithm involving kalman filtering was very well appreciated in our engineering group. He has perfected his knowledge in direct cosine transforms which are the critical components for 3D Orientation estimation. Apart from Engineering, he also demonstrated competence in Technology development. He solved a critical Bluetooth problems in Apps owned by BOSCH. He was involved in interacting with international engineering teams for developing Test Benches for Diesel Injection Systems. He has cultivated healthy hobbies over years. He is a good admirer of Racing Technology; this helped him to learn effortlessly about the state of the art technologies in the high performance automotive world. As a hobby he also pursued sound engineering with professional quality. He is a self learned music composer and engineer. Given an opportunity to pursue advanced studies in the "Control and Automation" space (which is very close to his heart). I am sure he will make a mark in this domain."

— **Vamsidhar Sunkari**, managed Hrishik at Robert Bosch Engineering and Business Solutions Ltd.

"Hrishik comes as a very hard working, innovative and a technology enthusiast. He had worked as an intern with National Instruments under my guidance and he did a project on rapid prototyping of a 4-stroke gasoline internal combustion engine. He demonstrated great cognitive abilities to understand engine modelling which was not a part of his undergraduate curriculum. The implementation and the application of LabVIEW as a development platform to achieve the aforesaid objectives in a short span of 1 month was truly commendable. Also, the literature available on this niche subject was very limited and hence a novel approach had to be assumed by taking into account the system configuration mentioned in academic papers. Hrishik was very resourceful in getting all the required information and his project was used in many customer demonstrations by our organization. He was a true asset to my team. I wish him all the best in his future endeavours."

— **Pavan Ramesh**, managed Hrishik at National Instruments

Contact Hrishik on LinkedIn