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RESEARCH INTERESTS

My research interest focus on developing algorithms that enable a dynamic walking on bipedal robots, for this purpose I want to rely on Control Theory to exploit the natural dynamics of such underactuated systems. Walking can be achieved by divers techniques these days, however, pushing the current understanding of human walking and Control Theory can lead to more agile behaviors and open the interaction with humans in unmodeled environments.

- Robotics
- Control Systems
- Robotic Walking
- Artificial Intelligence
- Dynamic Simulation
- Embedded Systems

CAREER GOAL

To Become a world-class roboticist with a multidisciplinary background in science and engineering that allows me to design, implement and develop control algorithms for robots and also lead a group of roboticist to develop novel groundbreaking technologies that unveil a robot with full capacities to interact autonomously in human environments.

EDUCATION

Universidad Nacional de Ingeniería Lima, Perú | 2008 - 2012 Aug
Bachelor of Science in Mechatronic Engineering
Rank in class: 2nd.

RESEARCH EXPERIENCE

A&M Prosthetic - AMPRO2 | Master Student - Amber Lab | 2015

Development of a transfemoral prosthesis named AMPRO 2. AMPRO 2 is the second iteration of the A&M Prosthesis and have improvements on weight and reduction of dimensions. It also was controlled using Model Independent Control Lyapunov Functions based on Quadratic Programs. It was tested to perform Flat Foot and Multicontact Walking under Hybrid Zero Dynamics approach.

A&M Prosthetic - AMPRO | Master Student - Amber Lab | 2014

Development of a transfemoral prosthesis named AMPRO. AMPRO was controlled using Model Independent Control Lyapunov Functions based on Quadratic Programs. It was tested to perform Flat Foot, Multicontact Walking and Stair Climbing Locomotion under Hybrid Zero Dynamics, it is now succeeded by

the new device AMPRO 2,

Development of a prosthetic device, AMPRO | 2013

This leg prosthesis is aimed to help people to recover walking capabilities, this offers an autonomous robotic system that relies on Hybrid Systems and Human Inspired Walking. As part of my activities in this project, I coded a C++ based CANOpen protocol based on the ROS system, and I also worked on the implementation of the controllers.

Gazebo based Simulation of AMBER 2 Robot using Control Lyapunov Functions | 2013

I implemented a Gazebo simulation of our robot AMBER 2 to test our controllers starting from PD control to Control Lyapunov Functions in the context of Human Inspired Control and Hybrid Zero Dynamics.

Stability control for a humanoid robot | Robotics Research - GISCIA | 2011- 2012

- My team built a 21-cm and 18 DOF humanoid robot. The controller was designed and tested in Simulink as a PD controller driving the hips and ankles to maintain the ZMP inside the support polygon described by the robot's support feet in order to guarantee the stability. The walking pattern was approximated to a cubic spline routine for each foot and then a simulation was performed with SimMechanics. We obtained a stable walking in simulation as well in the implementation phase.

Development of a seismic data acquisition system | Freelance Project | 2010

- As requirement of the Peruvian-Japanese Institute of Seismic Research and Disaster Mitigation (CISMID)¹, we developed an embedded system capable of recording small vibrations in structures and a software framework to visualize the magnitude of vibrations over the time, compute the fast fourier transform and extract the data for further analysis on other software packages.

Design of a trajectory controller for an omnidirectional robot | Modern Control Theory Course | 2010

- I Designed a controller for an omnidirectional robot in order to follow a desired trajectory. The controller was based on Linear Quadratic Regulators and trajectory linearization concepts; the implementation was performed in Matlab/Simulink obtaining successful results, we were able to follow circular patterns even adding some model disturbances.

Skin detection using YCrCb color space | Computer Vision Project - CEDIM | 2010

- I coded an application to transform the RGB information to the YCrCb color space, adding some thresholds I could obtain the skin color to be showed in the output information while filtering other colors out. Basic tracking functionality was later added to show a ball trajectory (adjusting the thresholds to recognize its color). This code was programmed in C++ using OpenCV libraries.

Tele-operated mobile combat robot: assembly, fabrication & mechanical design | Robotics Project - CEDIM | 2009

- Designed the mechanical structure of a combat robot using SolidWorks; the space for integration of sensors, microcontroller, wheels, weapon and battery was delimited. We had some discrepancies in the fabrication phase, but besides it, we could finish the robot with some differences with the designed robot.

¹ <http://www.cismid-uni.org/>

The robot's goal was to participate in local competitions in robot battles.

INDUSTRIAL EXPERIENCE

- Mechatronic Engineering Engitronic | January 2012 - April 2012

Worked as a designer and programmer of embedded systems, developing applications for automation and telecommunications. Other activities involved tutoring classes about microcontrollers and programming.

ACADEMIC ACHIEVEMENTS & HONORS

Universidad Nacional de Ingeniería Scholarship. (2012) Peru

In order to cover part of the expenses related with my Internship at Texas A&M I received funding from my home University (\$3,300).

Universidad Nacional de Ingeniería Board of Trustees Scholarship. (2012) Peru

The Board of Trustees of my University accepted to give an scholarship for my high academic scores and my internship to Texas A&M University (\$3000)

Peruvian Science and Technology Council for training future researchers Scholarship. (2012)

Financial support to cover part of expenses travelling Texas A&M, these funding was oriented to support the living expenses and the travelling expenses to Texas A&M (\$2,600)

Fulbright Scholarship: Opportunity Scholarship to outstanding students. (2012) Peru

Awarded with full coverage of expenses for applying to 05 American Graduate Programs. This prize recognizes students with outstanding university achievements and with low economic conditions.

Dean's list: 2008 - 2012

Recognized as one of the best students, ranking always in the top fifth of my class, and finishing as 2nd best student of my class.

CONGRESS AND SEMINARS

Congreso Internacional de Ingeniería Eléctrica, Electrónica y de Sistemas

International Congress of Electrical, Electronic and Systems Engineering. IEEE INTERCON

- 1st place Student Project Contest at INTERCON Conference, Lima - Peru. (2011)

Universidad Nacional de Ingeniería

Project: Stability Control of a Humanoid Robot.

Congreso Nacional de Estudiantes de Ingeniería Mecánica, Eléctrica y de Ramas Afines.

National Congress of Students of Mechanical, Electrical Engineering. IEEE CONEIMERA

- 2nd place Student Project Contest at CONEIMERA Conference at Puno - Peru. (2011).

Universidad Nacional del Altiplano

Project: Stability Control of a Humanoid Robot.

Simposio Nacional de Tecnología. National Symposium of Engineering. IEEE SINATEC

- 1st place Student Project Contest at SINATEC Conference at Callao, Lima - Peru. (2011).

Universidad Nacional del Callao

Project: Design of a Stable Humanoid robot with stereoscopic vision.

**Congreso Internacional de Ingeniería Eléctrica, Electrónica y de Sistemas.
International Congress of Electrical, Electronic and Systems Engineering. IEEE INTERCON**
- 1st place Student Free Style Robot Contest at INTERCON Conference at Lima - Peru. (2012).
Pontificia Universidad Católica del Perú.
Robot: Robbie, The Open Humanoid.

**Congreso Internacional de Ingeniería Eléctrica, Electrónica y de Sistemas.
International Congress of Electrical, Electronic and Systems Engineering. IEEE INTERCON**
- 3rd place Student Project Contest at INTERCON Congress at Lima - Peru. (2012).
Pontificia Universidad Católica del Perú.
Project: Development of an open platform for research in Humanoid robots.

IMPORTANT SPEECHES & INTERVIEWS

Quick Tools for Robotics Development

Centro de Tecnologías de Información y Comunicaciones. Universidad Nacional de Ingeniería. Lima, Perú.

Center of Technologies of Information and Communication. National University of Engineering. Lima, Perú.

This speech was oriented to introduce micro computers and low cost embedded systems as well as Gazebo and ROS to increase the speed of algorithms implementation.

Dynamic Walking in Humanoid Robots

Facultad de Ingeniería Mecánica. Universidad Nacional de Ingeniería. Lima, Perú.

Mechanical Engineering Department, National University of Engineering. Lima, Perú.

The purpose was to talk about different methods to get a Robotic Walking and the main results obtained using them. The review started with ZMP methods, Hopping Robots and Hybrid Systems.

AFFILIATIONS

A&M Bipedal Experimental Robots (Amber Lab) - Visiting Scholar

Texas A&M University.

<http://www.bipedalrobotics.com/>

Centro de Estudiantes de Ingeniería Mecatrónica (CEDIM) (Mechatronic Engineering Student Center) - Former Member

Universidad Nacional de Ingeniería. National University of Engineering.

<http://www.cedim.uni.edu.pe>

Grupo de Investigación en Sistemas de Control e Inteligencia Artificial (GISCIA) (Research Group in Control Systems and Artificial Intelligence) - Former President

Universidad Nacional de Ingeniería. National University of Engineering.

<http://giscia.wikidot.com/>

SOFTWARE SKILLS

Operating Systems: Windows and Linux OS.

Programming Languages: C/C++, Python, Java, Visual C#.

Robot Programming: ROS, Gazebo.

CAD: Solidworks, AutoCAD.

Scientific Applications: LabVIEW, Matlab/Simulink, Mathematica.

Electronic Design: Eagle, Proteus.

Others: MS Office, LaTeX.

LANGUAGES SKILLS

- English: Advanced level.
- Spanish: Native speaker

RELEVANT UNDERGRADUATE COURSES TAKEN

Embedded Systems, Classical Control Theory, Optimal Control, Robotics, Object Oriented Programming, Multi-Body Dynamics, Probability and Statistics, Artificial Intelligence, Machine Learning*, Programming a Robotic Car*

* Web based Courses.

GRADUATE COURSES TAKEN

Design of Control Systems
Methods of Applied Mathematics I
Mechanics of Robotic Manipulation
Convex Optimization
Mechanical Vibrations
Introduction to Classical Analysis*
Modern Control*
Scientific Writing*

* Currently taking.

COMMUNITY SERVICE

Big Event². Texas A&M University. 2013

The Big event gives the opportunity to help residents in the area Bryan/College Station in different tasks from cleaning to painting a house.

Pinoteca³. AFI Peru. 2012

Pinoteca is a social project aimed to help children in a poor and dangerous place in Lima, Peru. The activities are designed to have the children playing and develop social principles to reject local gangs. I gave support during the anniversary of this program, motivating families to bring their childrens and running several games.

EXTRACURRICULAR ACTIVITIES

Finalist in Physics National Competition | High School (2007)

Finalist in Chemistry National Competition | High School (2007)

Capoeira at Malunda Capoeira Group | (2010 - 2012).

² <http://bigevent.tamu.edu/>

³ <http://pinoteca.wordpress.com/>

