Revista Iberoamericana de Automática e Informática Industrial
CEA comité español de automática
ISSN: 1697-7912. Vol. 5, Núm. 4, Octubre 2008, pp. 92-96
http://www.revista-riai.org

Resúmenes en Inglés
English Abstracts

Modeling and Control of Autonomous Helicopters. State of the Art

Béjar, M. * Ollero, A. **

** Universidad Pablo de Olavide*
Área de Ingeniería de Sistemas y Automática
Ctra. Utrera Km1, 41013 Sevilla, España
e-mail: mbejdom@upo.es
*** Universidad de Sevilla-Centro Avanzado de Tecnologías Aeroespaciales*
Departamento de Ingeniería de Sistemas y Automática
Camino de los Descubrimientos s/n, 41092, Sevilla, España
e-mail: aollero@cartuja.us.es

Abstract: This paper presents a review of the state of the art on modelling and control of autonomous helicopters. It includes autonomous helicopter platforms, existing control architectures, and issues related to the state estimation and fault detection. Model selection and identification for autonomous helicopters are also raised. Next the control system is discussed in certain detail explaining different methods and also introducing trajectory planning and control techniques to perform aggressive maneuvers. Copyright © 2008 CEA.

Keywords: autonomous helicopters, autonomous helicopters control, helicopters modelling and identification, control architectures, aerial robotic.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 5-16

Modeling, Analysis and Control of Active Magnetic Bearings Systems.

I. Arredondo, J. Jugo, S. Alonso-Quesada,
I. Lizarraga and V. Etxebarria

Electricity and Electronics Department. University of the Basque Country.
e-mail: inigo.arredondo@ehu.es, josu.jugo@ehu.es,
santiago.alonso@ehu.es, ibone.lizarraga@ehu.es,
victor.etxebarria@ehu.es

Abstract: In this study the modeling, control design, robustness analysis and vibration active suppression procedure of a system, based on a rotor hovered by active magnetic levitation, are presented. Firstly, the model obtaining and its main characteristics are described. Utilizing this model and taking advantage of its symmetry properties, a stabilizing controller is designed. Then, it is tuned by means of a robustness study, according to the standard ISO 14839-3. Finally, a reduction of the vibrations produced in rotation is performed, using adaptive control. The designed controller has been experimentally implemented successfully. Copyright © 2008 CEA.

Keywords: Active Magnetic Bearings, Modeling, Robustness, Active Control, Machining.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 17-27

Physical Parameters Estimation of a Vehicle.

Eduardo Haro Sandoval

Universidad Panamericana,
Augusto Rodin 498, 03920 México D.F.
e-mail: eharo@up.edu.mx.

Abstract: In this article the identification process of a vehicle model is presented, going from modeling to the physical parameter estimation. The equations of the lateral dynamics of the vehicle model are used. It is shown that the chosen variables composing the optimization criterion makes the number of local minima smaller and so finding the solution is easier. Optimization is made with a modified genetic algorithm using Simplex crossover, and the parameters are estimated with only one kind of experiment based on collected real data. Copyright © 2008 CEA.

Keywords: Vehicle dynamics, identification, genetic algorithms, parametric estimation.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 28-35

Positioning System for Autonomous Vehicles.

V. Milanés*, J.E. Naranjo, C. González*, J. Alonso*, R. García *, T. de Pedro***

**Instituto de Automática Industrial (CSIC)*
Carretera de Campo Real km 0,200, Arganda del Rey, 28500, Madrid,
España (e-mail: {vmilanes,gonzalez,jalonso,ricardo,tere}@iai.csic.es)
***Departamento de Sistema Inteligentes Aplicados,*
Universidad Politécnica de Madrid, Carretera de Valencia km 7, 28031, Madrid,
España (e-mail: jnaranjo@eui.upm.es)

Abstract: Loss of accuracy in automated vehicle position control systems due to Global Positioning System (GPS) signal quality is currently one of the most studied research topics in the field of Intelligent Transportation Systems (ITS). This paper presents an integrated positioning system that combines a GPS with onboard sensors and an Inertial Measurement Unit (IMU) to perform autonomous vehicle guidance. Depending on GPS precision, the system discriminates which positioning is most appropriate from three different possibilities: 1) real-time kinematic differential global positioning system (RTK-DGPS) is working at the highest positioning accuracy (1 cm). In this instance, GPS data are used as the main sensory supply; 2) total DGPS signal loss. Now, the IMU control system takes control; 3) centimeter accuracy is lost. In this instance, GPS and IMU measurements are integrated to determine the true positioning. This system has been installed in a Citroën C3 Pluriel car, where all the actuators were automated to achieve human-like driving. Experimental results show the car's behavior in diverse situations and prove that the test-bed vehicle can maintain automatic navigation even when GPS positioning is unavailable. The results also show the need to combine sensory information to obtain optimum navigation control in any circumstance. Copyright © 2008 CEA.

Keywords: automated guided vehicles, global positioning systems, inertial measurement unit.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 36-41

Geometric procedure for the Automatic Synthesis of Force-Closure Grasps with Four Fingers on Polyhedral Objects.

Ricardo Prado and Raúl Suárez

Instituto de Organización y Control de Sistemas Industriales (IOC), Universidad Politécnica de Cataluña (UPC) Av. Diagonal, 647, Barcelona, España (sixto.ricardo.prado@upc.edu, raul.suarez@upc.edu).

Abstract: The synthesis of Force-Closure Grasps is one of the fundamental problems in the grasp and manipulation of objects by means of mechanical hands. In this work a geometric method to determine force-closure grasps on polyhedral objects is presented. First the sets of faces whose relative orientations and positions allow obtaining force-closure grasps (concurrent prensiones, flat-pencils and regulus) are determined. Second, these sets are evaluated using a quality function and the best one is selected for the grasp; and third, on the selected set faces the fingertip contact points are determined such that they assure the force-closure property. This method is based on geometric operation in the 3D physical space and do not present iterative loops. The article includes a comparison of the resulting grasps with the optimum ones in different cases.

Keywords: Robotic, mechanical hands, Force-closure grasps.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 42-53

Visual Servo Control of a Robot Manipulator based on Passivity.

Carlos Soria*, Flavio Roberti*, Ricardo Carelli*, José M. Sebastián**

**Instituto de Automática, Facultad de Ingeniería, Universidad Nacional de San Juan, Av. San Martín Oeste 1109, J5400ARL, San Juan, Argentina (e-mail: {csoria, froberti, rcarelli}@inaut.unsj.edu.ar)*
***Departamento de Automática, Ingeniería Electrónica e Informática Industrial Esc. Técnica Superior de Ingenieros Industriales, Universidad Politécnica de Madrid, C/ José Gutiérrez Abascal, nº2, 28006, Madrid, España (e-mail: jsebas@etsii.upm.es).*

Abstract: In this work a visual servo control based on the passivity properties of the visual system is designed. It proposes a regulator with variable control gains, to avoid the saturations of the actuators while introducing the ability to correct errors of small magnitude. Also the design is done taking into account the L2 performance, to give the capacity to track moving objects, with a small error control. Experimental results are showed in an industrial robot manipulator planar type to verify the compliance with the objectives of the proposed controller.

Keywords: industrial robot manipulator, visual servo control, non linear control, passivity.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 54-61

PD Control of Robots: Actuator Dynamics and a New Tuning Procedure.

V. M. Hernández * V. Santibáñez ** R.V. Carrillo * J. Molina * J.J. López *

** Universidad Autónoma de Querétaro. Facultad de Ingeniería. A.P. 3-24, 76150, Querétaro, Qro., México (e-mail: vmhg@uaq.mx)*
*** Instituto Tecnológico de la Laguna. División de Estudios de Posgrado e Investigación. A.P. 49-1, 27001, Torreón, Coah. México (e-mail: vsantiba@itlalaguna.edu.mx).*

Abstract: This paper is concerned with PD control with desired gravity compensation for rigid robots. We introduce a new, less conservative, tuning procedure to select the controller's proportional gains. We prove global asymptotic stability by taking into account the electrical dynamics of brushed DC-motors actuators. Contrary to the common assumption in literature, our result does not require electrical dynamics to be faster than the mechanical dynamics. We present a formal study of the well known practical control strategy called torque control.

Keywords: Robot control, PD control, Stability, Position regulation, Actuators.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 62-68

Bio- Inspired Model for Gestures Recognition through Vision-based Movement Primitives.

Sandra E. Nope* Humberto Loaiza Eduardo Caicedo*** l**

** Grupo de Percepción y Sistemas Inteligentes (PSI) – E.I.E.E. Universidad del Valle, Ciudad Universitaria Meléndez, Calle 13 nº100-00, Cali, Colombia (e-mail: sandranope@univalle.edu.co) **Grupo de Percepción y Sistemas Inteligentes (PSI) – E.I.E.E. Universidad del Valle, Ciudad Universitaria Meléndez, Calle 13 nº100-00, Cali, Colombia (e-mail: hloaiza@univalle.edu.co) *** Grupo de Percepción y Sistemas Inteligentes (PSI) – E.I.E.E. Universidad del Valle, Ciudad Universitaria Meléndez, Calle 13 nº100-00, Cali, Colombia (e-mail: ecaicedo@univalle.edu.co)*

Abstract: This article addresses the issue of gesture recognition using movement primitives to obtain a bio-model that, in a close future, can be used in the robot programming through the imitation learning paradigm. Those movement primitives are extracted from consecutive images caught by a standard web cam. For robot programming by imitation, gesture recognition was identified as first phase, which requires three main aspects to be taken into consideration. These are the instantaneous movement representation, the temporal integration of related information, and the classification strategy. These three aspects are going to be developed in this article and in contrast to other works in this field; the movement extraction and its codification are inspired in the macaco´s brain motion processing. The obtained model was applied then to the recognition of four different hand gestures performed by different people. The success percentage using different standard classification strategies varied between 91.42% and 97.14%.

Keywords: Gesture Recognition, bio-inspired model, movement primitives, movement codification, temporal integration, and artificial vision.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 69-76

Control of the DC/DC Boost Converter using Sliding Modes and Differential Flatness: Experimental Results.

R. Silva-Ortigoza *, H. Sira-Ramírez ** and V. M. Hernández-Guzmán ***

** CIDETEC-IPN. Departamento de Posgrado. Área de Mecatrónica. Unidad Profesional Adolfo López Mateos. C.P. 07700, México, D.F., MÉXICO. (e-mail: rsilvao@ipn.mx)*
*** CINVESTAV-IPN. Departamento de Ingeniería Eléctrica. Sección de Mecatrónica. C.P. 07360, México, D.F., MÉXICO. (e-mail: hsira@cinvestav.mx)*
**** Universidad Autónoma de Querétaro. Facultad de Ingeniería. A.P. 3-24. C.P. 76150, Querétaro, Qro., MÉXICO. (e-mail: vmhg@uaq.mx)*

Abstract: This paper is concerned with control of the DC/DC boost converter. Specifically, we propose a solution for output voltage trajectory tracking. Because of the non-minimum phase property of this converter when voltage is the controlled output we design an indirect control strategy based on a combination of sliding modes and differential flatness. This means that we achieve output voltage trajectory tracking by means of a controller which is designed for output current trajectory tracking. We also present some experimental results using the proposed control strategy which show that satisfactory performance is achieved. We use the National Instruments TM PCI-6025E electronic card together with MATLAB®–Simulink®. Copyright © 2008 CEA.

Keywords: Indirect Control, DC/DC Boost Converter, Sliding Modes, Differential Flatness, Trajectory Tracking.

RIAI, Vol. 5, Núm. 4, Octubre 2008, pp. 77-82