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with a special section on Unmanned Systems

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This paper proposes a novel distributed EKF-SLAM system that combines the advantages of EKF-SLAM and distributed SLAM systems. The system model of this novel SLAM system has a distributed structure, and each s...

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This paper presents the investigation of the use of position-sensing diode (PSD) - a light source direction sensor - for designing a vision-based navigation system for a perching aircraft. Aircraft perching ma...

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The parametrized model of the Unmanned Aerial Vehicle (UAV) is a crucial part of control algorithms, estimation processes and fault diagnostic systems. Among plenty of available methods for model structure or ...

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Unmanned aircraft such as multirotors are typically limited in endurance by the need to minimise weight, often sacrificing power plant mass and therefore output. Wireless power transmission is a method of deli...

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Development and verification of real-time algorithms for robotic total stations usually require hard-ware-in-the-loop approaches, which can be complex and time-consuming. Simulator-in-the-loop can be used inst...

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In this paper we focus on the stochastic kinetic extension of the well-known Hodgkin-Huxley model of a biological neuron. We show the gradient descent algorithm for training of the neuron model. In comparison ...

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A small bedside agent for preventing falls has been developed. It talks to a person on a bed to prevent them from getting out of bed abruptly, until a care worker arrives. This paper describes the user-oriente...

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In this paper, we describe a wearable first-person video (FPV) analysis system for evaluating the skill levels of caregivers. This is a part of our project that aims to quantize and analyze the tender-care tec...

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Mobile robots are playing a significant role in Higher Education science and engineering teaching, as they offer a flexible platform to explore and teach a wide-range of topics such as mechanics, electronics a...

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Human re-identification is an important feature of domestic service robots, in particular for elderly monitoring and assistance, because it allows them to perform personalized tasks and human-robot interaction...

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Many real-world robotic scenarios require performing task planning to decide courses of actions to be executed by (possibly heterogeneous) robots. A classical centralized planning approach has to find a soluti...

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This paper introduces a predictive closed-loop trajectory tracking algorithm for nonlinear control systems that combines the Model Predictive Control (MPC) approach with the task priority Lifted Newton method....

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This paper addresses the kinematically optimal control problem of the mobile manipulators. Dynamic equations of the mobile manipulator are assumed to be uncertain. Moreover, globally unbounded disturbances are...

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Planetary exploration poses many challenges for a robot system: From weight and size constraints to extraterrestrial environment conditions, which constrain the suitable sensors and actuators. As the distance ...

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This paper deals with the real-time trajectory generation problem for two cooperating mobile robots moving the common rigid object. The holonomic constraints resulting from a closed kinematic chain and the dyn...

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[Employing Natural Terrain Semantics in Motion Planning for a Multi-Legged Robot](https://link.springer.com/article/10.1007/s10846-018-0865-x)

This paper considers motion planning for a six-legged walking robot in rough terrain, considering both the geometry of the terrain and its semantic labeling. The semantic labels allow the robot to distinguish ...

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The paper presents a robotic system design methodology based on the concept of an embodied agent decomposed into communicating subsystems, whose activities are specified in terms of FSMs invoking behaviours pa...

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[Normal Forms and Configuration Singularities of a Space Manipulator](https://link.springer.com/article/10.1007/s10846-018-0883-8)

This paper addresses the problem of normal forms and singularities of non-holonomic robotic systems represented by control-affine systems. By means of the concept of the end-point map of the system, and of the...

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[Parametric Study on Formation Flying Effectiveness for a Blended-Wing UAV](https://link.springer.com/article/10.1007/s10846-018-0842-4)

This paper investigates aerodynamic performance improvements of formation flight at transonic speeds for a medium size Unmanned Aerial Vehicle (UAV). The metric for assessing the aerodynamic improvement of for...

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One of the major challenges of conducting operations of unmanned aircraft, especially operations beyond visual line-of-sight (BVLOS), is to make a realistic and sufficiently detailed risk assessment. An import...

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1. Article

Open Access

[A Control Method for Joint Torque Minimization of Redundant Manipulators Handling Large External Forces](https://link.springer.com/article/10.1007/s10846-018-0964-8)

In this paper, a control method is developed for minimizing joint torque on a redundant manipulator where an external force acts on the end-effector. Using null space control, the redundant task is designed to...

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1. Article

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[Camera Recognition and Laser Detection based on EKF-SLAM in the Autonomous Navigation of Humanoid Robot](https://link.springer.com/article/10.1007/s10846-017-0712-5)

The ability of autonomous navigation of the humanoid robot under unknown environment is very important to real-life applications. EKF-SLAM based on the camera recognition and laser detection for humanoid robot...

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1. Article

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[L\* Algorithm—A Linear Computational Complexity Graph Searching Algorithm for Path Planning](https://link.springer.com/article/10.1007/s10846-017-0748-6)

The state-of-the-art graph searching algorithm applied to the optimal global path planning problem for mobile robots is the A\* algorithm with the heap structured open list. In this paper, we present a novel al...

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1. Article

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[Performance Evaluation of Feature Detectors and Descriptors Beyond the Visible](https://link.springer.com/article/10.1007/s10846-017-0762-8)

Feature detection and description algorithms represent an important milestone in most computer vision applications. They have been examined from various perspectives during the last decade. However, most studi...

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[A Preliminary Study on Robot-Assisted Ankle Rehabilitation for the Treatment of Drop Foot](https://link.springer.com/article/10.1007/s10846-017-0652-0)

This paper involves the use of a compliant ankle rehabilitation robot (CARR) for the treatment of drop foot. The robot has a bio-inspired design by employing four Festo Fluidic muscles (FFMs) that mimic skelet...

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This work address hyperspectral imaging systems use for maritime target detection using unmanned aerial vehicles. Specifically, by working in the creation of a hyperspectral real-time data processing system pi...

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1. Article

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[Effective Turning Motion Control of Internally Actuated Autonomous Underwater Vehicles](https://link.springer.com/article/10.1007/s10846-017-0544-3)

This paper presents a novel roll mechanism and an efficient control strategy for internally actuated autonomous underwater vehicles (AUVs). The developed control algorithms are tested on Michigan Tech’s custom...

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1. Article

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[The VFO-Driven Motion Planning and Feedback Control in Polygonal Worlds for a Unicycle with Bounded Curvature of Motion](https://link.springer.com/article/10.1007/s10846-017-0555-0)

Integrated motion planning and control for the purposes of maneuvering mobile robots under state- and input constraints is a problem of vital practical importance in applications of mobile robots such as auton...

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1. Article

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[VFO Path following Control with Guarantees of Positionally Constrained Transients for Unicycle-Like Robots with Constrained Control Input](https://link.springer.com/article/10.1007/s10846-017-0482-0)

The Vector-Field-Orientation (VFO) method is a control design concept which was originally introduced for the unicycle kinematics to solve two classical control tasks corresponding to the trajectory tracking a...

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1. Article

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[Machine Vision for UAS Ground Operations](https://link.springer.com/article/10.1007/s10846-017-0542-5)

This paper discusses the machine vision element of a system designed to allow Unmanned Aerial System (UAS) to perform automated taxiing around civil aerodromes, with only a monocular camera. The purpose of the...

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[Disturbance Observer Based Control with Anti-Windup Applied to a Small Fixed Wing UAV for Disturbance Rejection](https://link.springer.com/article/10.1007/s10846-017-0534-5)

Small Unmanned Aerial Vehicles (UAVs) are attracting increasing interest due to their favourable features; small size, low weight and cost. These features also present different challenges in control design an...

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1. Article

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[A New Directional-Intent Recognition Method for Walking Training Using an Omnidirectional Robot](https://link.springer.com/article/10.1007/s10846-017-0503-z)

In order to avoid being bedridden, a preemptive walking rehabilitation is essential for people who lose their walking ability because of illness or accidents. In a previous study, we developed an omnidirection...

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[Task and Context Sensitive Gripper Design Learning Using Dynamic Grasp Simulation](https://link.springer.com/article/10.1007/s10846-017-0492-y)

In this work, we present a generic approach to optimize the design of a parametrized robot gripper including both selected gripper mechanism parameters, and parameters of the finger geometry. We suggest six gripp...

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1. Article

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[Survey on Computer Vision for UAVs: Current Developments and Trends](https://link.springer.com/article/10.1007/s10846-017-0483-z)

During last decade the scientific research on Unmanned Aerial Vehicless (UAVs) increased spectacularly and led to the design of multiple types of aerial platforms. The major challenge today is the development ...

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[Lagrangian Jacobian Motion Planning: A Parametric Approach](https://link.springer.com/article/10.1007/s10846-016-0394-4)

This paper addresses the motion planning problem of nonholonomic robotic systems. The system’s kinematics are described by a driftless control system with output. It is assumed that the control functions are r...

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[A New Calibration Method for a Directly Driven 3**P**RR Positioning System](https://link.springer.com/article/10.1007/s10846-016-0403-7)

Calibration is one of the most important works for the parallel manipulator. The manufacturing and assembling errors will modify the designed parameters of the parallel mechanism, leading to the positioning er...

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1. Article

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[Point-to-Point Collision-Free Trajectory Planning for Mobile Manipulators](https://link.springer.com/article/10.1007/s10846-016-0390-8)

The collision-free trajectory planning method subject to control constraints for mobile manipulators is presented. The robot task is to move from the current configuration to a given final position in the work...

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1. Article

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[Minimizing Energy Cost in Multi-Legged Walking Machines](https://link.springer.com/article/10.1007/s10846-016-0398-0)

Due to their ability to avoid obstacles and to move over difficult terrain, moreover having the ability to adjust their posture, walking machines for many years have been considered as very promising devices f...

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[Control of Underactuated Skid Steering Mobile Platforms Based on Extended Factitious Force Concept](https://link.springer.com/article/10.1007/s10846-016-0389-1)

In the paper new control method of skid steering mobile platforms has been presented. Such platforms are robotic objects with deficit of control inputs in dynamic model, i.e. they are dynamically under-actuate...

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1. Article

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[Waypoint Following for Differentially Driven Wheeled Robots with Limited Velocity Perturbations](https://link.springer.com/article/10.1007/s10846-016-0391-7)

In this paper a unified motion control strategy dedicated for the waypoint following task realized by a differentially driven robot is presented. It is assumed that the vehicle moves with limited velocities an...

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1. Article

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[Robust Task Space Finite-Time Chattering-Free Control of Robotic Manipulators](https://link.springer.com/article/10.1007/s10846-016-0387-3)

This work deals with the problem of the accurate task space control subject to finite-time convergence. Kinematic and dynamic equations of a rigid robotic manipulator are assumed to be uncertain. Moreover, unb...

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[Novel Haptic Device Using Jamming Principle for Providing Kinaesthetic Feedback in Glove-Based Control Interface](https://link.springer.com/article/10.1007/s10846-016-0392-6)

This paper presents a new type of wearable haptic device which can augment a sensor glove in various tasks of telemanipulation. We present the details of its two alternative designs jamming tubes or jamming pads,...

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[Set-point Control of Mobile Robot with Obstacle Detection and Avoidance Using Navigation Function - Experimental Verification](https://link.springer.com/article/10.1007/s10846-016-0388-2)

This paper presents the results of an experimental verification of mobile robot control algorithm including obstacle detection and avoidance. The controller is based on the navigation potential function that w...

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[Emergency Flight Planning for an Energy-Constrained Multicopter](https://link.springer.com/article/10.1007/s10846-016-0370-z)

Small Unmanned Aircraft Systems (UAS) have diverse commercial applications. Risk mitigation techniques must be developed to minimize the probability of harm to persons and property in the vicinity of the aircr...

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1. Article

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[A Framework for Coupled Simulations of Robots and Spiking Neuronal Networks](https://link.springer.com/article/10.1007/s10846-016-0412-6)

Bio-inspired robots still rely on classic robot control although advances in neurophysiology allow adaptation to control as well. However, the connection of a robot to spiking neuronal networks needs adjustmen...

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1. Article

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[Distributed Cooperative Control of Multiple Nonholonomic Mobile Robots](https://link.springer.com/article/10.1007/s10846-015-0316-x)

In this paper, the distributed cooperative control problem is considered for multiple type (1,2) nonholonomic mobile robots. Firstly, a local change of coordinates and feedback is proposed to transform the ori...

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1. Article

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[Collaboration in Multi-Robot Exploration: To Meet or not to Meet?](https://link.springer.com/article/10.1007/s10846-015-0277-0)

Work on coordinated multi-robot exploration often assumes that all areas to be explored are freely accessible. This common assumption does not always hold, especially not in search and rescue missions after a ...

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[Functional Redesign of Mantis 2.0, a Hybrid Leg-Wheel Robot for Surveillance and Inspection](https://link.springer.com/article/10.1007/s10846-015-0240-0)

The paper discusses the redesign of the second version of the Mantis hybrid leg-wheel mobile robot, conceived for surveillance and inspection tasks in unstructured indoor and outdoor environments. This small-s...

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1. Article

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[Intellectual Development Model for Multi-Robot Systems](https://link.springer.com/article/10.1007/s10846-015-0224-0)

We propose the IDeM-MRS learning formalism to be used by a group of robots for solving practical tasks in indoor environments. The formalism is inspired on the theory of social learning models for human beings...

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1. Article

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[Optic Flow Regulation in Unsteady Environments: A Tethered MAV Achieves Terrain Following and Targeted Landing Over a Moving Platform](https://link.springer.com/article/10.1007/s10846-014-0062-5)

The present study deals with the risky and daunting tasks of flying and landing in non-stationary environments. Using a two Degree-Of-Freedom (DOF) tethered micro-air vehicle (MAV), we show the benefits of an ...

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1. Article

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[Terrain Classification and Negotiation with a Walking Robot](https://link.springer.com/article/10.1007/s10846-014-0067-0)

This paper describes a walking robot controller for negotiation of terrains with different traction characteristics. The feedback is based on three perception systems. The purpose of the presented research is ...

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[Virtual Force Concept in Steering Mobile Manipulators with Skid-Steering Platform Moving in Unknown Environment](https://link.springer.com/article/10.1007/s10846-013-9878-7)

Underactuated control system, namely mobile manipulator mounted on skid-steering platform has been considered in the paper. As a control scheme the concept of virtual force is presented and discussed. In such ...

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[Cascaded VFO Control for Non-Standard N-Trailer Robots](https://link.springer.com/article/10.1007/s10846-013-9881-z)

Articulated mobile robots consisting of a tractor and passively off-hooked trailers belong to a class of highly nonlinear, nonholonomic, structurally unstable, differentially non-flat, and underactuated dynami...

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[Motion Control of Vehicles with Trailers Using Transverse Function Approach](https://link.springer.com/article/10.1007/s10846-013-9882-y)

This paper is focused on analysis of the control solution using the transverse function approach. The controller considered here is designed for a nonholonomic vehicle with on-axle passive trailers. The main p...

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In the paper a comparative study of selected kinematic path following controllers for a wheeled mobile robot of (2,0) type has been presented. The control strategies are based on one of two approaches to the p...

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[Parametric and Non-parametric Jacobian Motion Planning for Non-holonomic Robotic Systems](https://link.springer.com/article/10.1007/s10846-013-9880-0)

This paper addresses computational aspects of the Jacobian motion planning algorithms for non-holonomic robotic systems. The motion planning problem is formulated in terms of a control problem in the control a...

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[Kinematics and Motion Planning of the Multi-Bar System](https://link.springer.com/article/10.1007/s10846-013-9867-x)

This paper studies a generalization to 3D space of the planar system composed of a tractor pulling a number of trailers, called the multi-bar system. Assuming a natural coordinate description of the system, it...

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[Dynamics and Motion Planning of Trident Snake Robot](https://link.springer.com/article/10.1007/s10846-013-9858-y)

The trident snake robot is a mechanical device that serves as a demanding testbed for motion planning and control algorithms of constrained non-holonomic systems. This paper provides the equations of motion an...

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[Hypermobile Robots – the Survey](https://link.springer.com/article/10.1007/s10846-013-9985-5)

This article presents a survey on hypermobile robots – a group of articulated mobile robots that typically comprise of several segments with powered wheels, tracks, or legs to propel the vehicle forward. Segme...

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[Fault Tolerant Formations Control of UAVs Subject to Permanent and Intermittent Faults](https://link.springer.com/article/10.1007/s10846-013-9951-2)

The paper addresses the formation control of unmanned aerial vehicles (UAVs) in the presence of permanent and intermittent faults in each UAV. A fault tolerant control (FTC) scheme is developed to accommodate ...

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[A Reference Software Architecture to Support Unmanned Aircraft Integration in the National Airspace System](https://link.springer.com/article/10.1007/s10846-012-9691-8)

This paper outlines an architecture that provides data and software services to enable a set of Unmanned Aircraft (UA) platforms to operate in a wide range of air domains which may include terminal, en route, ...

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[Approximation of Jacobian Inverse Kinematics Algorithms: Differential Geometric vs. Variational Approach](https://link.springer.com/article/10.1007/s10846-012-9679-4)

This paper addresses the approximation problem of Jacobian inverse kinematics algorithms for redundant robotic manipulators. Specifically, we focus on the approximation of the Jacobian pseudo inverse by the ex...

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[A Novel Trajectory Generation Method for Robot Control](https://link.springer.com/article/10.1007/s10846-012-9683-8)

This paper presents a novel trajectory generator based on Dynamic Movement Primitives (DMP). The key ideas from the original DMP formalism are extracted, reformulated and extended from a control theoretical vi...

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[Simultaneous Localization and Mapping Using Rao-Blackwellized Particle Filters in Multi Robot Systems](https://link.springer.com/article/10.1007/s10846-010-9457-0)

In this paper we investigate the problem of Simultaneous Localization and Mapping (SLAM) for a multi robot system. Relaxing some assumptions that characterize related work we propose an application of Rao-Blackwe...

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[A Model Based Approach to Modular Multi-Objective Robot Control](https://link.springer.com/article/10.1007/s10846-010-9523-7)

Two broad classes of robot controllers are the modular, and the model based approaches. The modular approaches include the Reactive or Behavior Based designs. They do not rely on mathematical system models, bu...

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This paper presents a new method for the semi-active control of the span system of linear guideways subjected to a travelling load. Two elastic beams are coupled by a set of controlled dampers. The relative ve...

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[Distributed Motion Constraints for Algebraic Connectivity of Robotic Networks](https://link.springer.com/article/10.1007/s10846-009-9328-8)

This paper studies connectivity maintenance of robotic networks that communicate at discrete times and move in continuous space. We propose a distributed coordination algorithm that allows the robots to decide...

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A new probabilistic roadmap method is presented for planning the path of a robotic sensor deployed in order to classify multiple fixed targets located in an obstacle-populated workspace. Existing roadmap metho...

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A new notion of joint, defined in terms of the state of motor (active or locked) and type of the elastic or rigid element, gear and/or link that follows after the motor, is introduced. Special attention is pai...

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