(Code: 2895)

Title: Dynamic Analysis of the KNTU CDRPM: A Cable Driven Redundant Parallel Manipulator

Pooneh Gholami, Mohammad Mohammadi Aref, Prof. Hamid Taghirad

Abstract: KNTU CDRPM is a cable driven redundant parallel manipulator, which is under investigation for possible high speed application such as 3D laser cutting machine. These newly developed mechanisms have several advantages compared to the conventional parable mechanisms. Its rotational motion range is relatively large, its redundancy improves safety for failure in cables, and its design is suitable for high acceleration motions. In this paper, the inverse kinematic analysis of this structure in is presented first, and then the Jacobian matrices of the manipulator are derived. Furthermore, the governing dynamic equation of motion of such structure is derived using the Newton-Euler formulation. Next, the dynamic equations of the system are used in simulations. It is shown that on the contrary to serial manipulators, dynamic equations of motion of parallel manipulators can be only represented implicitly, and only special integration routines can be used for their simulations. In order to verify the accuracy and integrity of the derived dynamics, open-- and closed--loop simulations for the system is performed and analyzed. It is shown that high gain PD controllers are able to reduce the induced vibration caused by the cable structures in these manipulators.

Keywords: Parallel manipulator, Inverse kinematics, Jacobian analysis,

CTRL10
Robotics 2

(Code: 2024)

Title: A Hybrid Method for Adaptive Routing in Car Navigation Systems (Fuzzy Expert System + Learning Automata)

Narges Afshordi, Mohammad Reza Meybodi

Abstract: In this paper a novel adaptive routing method based on learning automata is proposed The proposed method is obtained by combining fuzzy expert system and learning automata. Learning automata are used to fine tune membership functions in the fuzzy expert system. The proposed method aims to provide the driver with more preferable routes by learning his/her preferences. For evaluation purposes, the proposed method was implemented on the city of Tehran, and the results were compared with a previous method for tuning fuzzy expert systems through reinforcement learning. Comparison results show better performance for the proposed algorithm.

Keywords: Car Navigation Systems, Adaptive Routing, Learning Automata, Fuzzy Expert System

(Code: 2654)

Title: Gait Planning and Motion Control of a Biped Robot

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Abstract: Biped robots have higher capabilities than other mobile robots, for moving on uneven environments. However, due to natural instability of these robots, their motion planning and control become a more important and challenging task. This article, will present a nonlinear and non-model-based algorithm for control of the biped robots. To this end, the concept of Transpose Jacobian Algorithm is used as a constraint on a virtual end-effecter for tracking desired. The proposed algorithm is designed base on constraining four important points of the biped robot, considering a virtual spring and damper between each of these points and the corresponding desired trajectory. These four points include the tip of right and left foot, the hip joint and the total center of mass (CM). In the control of the biped robots with desired trajectory in the task space, the system may track the desired trajectory while the knee is broken. This problem is solved here using a proposed routine which will be called Knee Stopper. Similarly, an algorithm is proposed as Trunk Stopper to limit trunk motion. Obtained results show that the proposed gait planner and the control law can be successfully used in tracking desired trajectories.

Keywords: Biped robots, Humanoid, Gait planning, Stability, Control

(Code: 2853)

Title: A New Method for Cooperative Robot Map Building by Using Sonar, Camera and Odometry Data Fusion

Kaveh Ahmadi, Khoshnam Shojaee, Alireza Mohammad Shahri

Abstract: In this paper we use a new method for cooperative robot map building by using sonar, camera and odometry data fusion. in this method we use camera only for tracking each robot by another one and we don't use a complicated image processing strategy. the main sensor for mapping is sonar. our method reduce the ignorance and inconsistency in sonar's data and extract a fresh map of environment

Keywords: Cooperative robot, Sonar, Camera, Exploration

(Code: 2868)

Title: Obstacle Avoidance of a Mobile Robot in Dynamic Environment with a New Navigation Strategy

Hamid Ghadiri, Ghasem Alizadeh, Reza Dalayi

Abstract: The motion planning and control problem is a well-known problem in the field of robotics. The objective is to find