(Code: 2895)
**Title:** Dynamic Analysis of the KNTU CDRPM: A Cable Driven Redundant Parallel Manipulator
Poonagh Ghoddusi, Mohammad Mohammadi Refq, Prof. Hamid Taghihirad

**Abstract:** KNTU CDRPM is a cable driven redundant parallel manipulator, which is under investigation for possible high speed applications such as 3D laser cutting machines. These newly developed mechanisms have several advantages compared to the conventional parallel 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 is presented first, and then the Jacobian matrices of the manipulator are derived. Furthermore, the governing dynamic equations 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 for 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 are 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,

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**CTRL10**
**Robotics 2**

(Code: 2654)
**Title:** Gait Planning and Motion Control of a Biped Robot
Seyed Ali A. Moosavi, Mansoor Alighooreh, Amir Takhmari

**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-effector for tracking desired. The proposed algorithm is designed based 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

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(Code: 2853)
**Title:** A New Method for Cooperative Robot Map Building by Using Sonar, Camera and Odometry Data Fusion
Kaveh Ahmadi, Khoshnam Shojaei, Alireza Mohammad Shari

**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 reduces the ignorance and inconsistency in sonar's data and extracts a fresh map of environment.

**Keywords:** Cooperative robot, Sonar, Camera, Exploration

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(Code: 2868)
**Title:** Obstacle Avoidance of a Mobile Robot in Dynamic Environment with a New Navigation Strategy
Hassan Ghasemi, Ghasem Alizadeh, Reza Dali

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