I-TP02 Mobile Robot 1

13:00-15:00 **Chair : Mun Sang Kim (KIST)**
Room : C106 **Co-Chair : Nakano Eiji (Tohoku Univ.)**

13:00– 13:20 **I-TP02-1**

Analysis of step climbing and descending by tandem wheelchairs connected by passive link

Hidetoshi IKEDA,Zhi-Dong WANG, Takayuki TAKAHASHI,Eiji NAKANO(Tohoku Univ.)

This paper describes a new cooperative strategy for two wheelchairs to climb a step. These two wheelchair robots are connected with a simple linkage mechanism between the rear of one wheelchair and the front of another. Two wheelchair robots climb a step one after the other. In this research, we did not use a method by which a robot lifts up and supports its weight using any special actuator but a method of handling the robot's moment of rotation by the force of the link which come from the assisting robot. This method is especially influenced by the height of the two robot's link positions. So we study this method from the viewpoint of changing the two-link positions....

13:20 – 13:40 **I-TP02-2**

Three Dimensional Environment Modeling for Mobile Robots Using Growing Neural Gas Network

Min Young Kim, Hyung Suck Cho(KAIST) Jae Hoon Kim(Samsung Heavy Industries)

As the era of the human friendly robot looms, the intelligent autonomous mobile robots have obtained tremendous interests in recent years. The robots may be service robots for serving human or industrial robots for replacing human. For the coexistance with human, the robots must be able to feel and recognize three dimensional space that human live. In this paper, we propose three dimensional environmental modeling method based on a neural network technique called Growing Neural Gas Network. The purpose of this neural network is to generate a graphical structure which reflects the topology of the input space. Through this method, the robots' surroundings are autonomously segmented ...

13:40 – 14:00 **I-TP02-3**

Stairs Adaptable Wheeled Mobile Robotusing Passive Linkage Mechanism

Chun-Kyu Woo, Soo-Hyun Kim, and Yoon-Keun Kwak(KAIST) Mun-Sang Kim(KIST)

In this paper, we designed the 6-wheeled mobile robot (6-WMR) with the passive linkage mechanism which enables 6-WMR to passively adapt to the given stairs. To overcome the limit of adaptability to the terrain of conventional WMR and improve the energy efficiency, we proposed the new WMR using the passive linkage mechanism. The passive linkage mechanism consists of the simple four-bar linkage mechanism which allows 6-WMR to climb stairs with adaptability and an additional link which is connected to the four-bar linkage mechanism by a pin-slot joint to enable 6-WMR to passively go up the stairs. We made a miniature model of the proposed 6-WMR ...

14:00 – 14:20 **I-TP02-4**

ROBHAZ-DT : Variable Configuration Double-Track Mobile Robot for Hazardous Environment Applications

Changhyun Cho. , Changwoo Park , Sungchul Kang, Munsang Kim(KIST), Cheonghee Lee,and Yoon-Keun Kwak(KAIST)

In this paper, design and integration of a newly developed double-tracked mobile robot called ROBHAZ-DT are introduced. It is designed to carry out military and civil missions in various hazardous environments such as the areas of fire, war, disaster and mine field etc. ROBHAZ-DT is configured with three mechanical bodies, namely front, rear and main body. By using its rotational passive adaptation mechanism equipped between the front and rear bodies, ROBHAZ-DT shows a good mobile capability on uneven terrain including stairs. The passive adaptation mechanism reduces energy consumption and offers simplicity in the design of the ROBHAZ-DT...

14:20 – 14:40 **I-TP02-5**

Design of a Wheeled Blimp

Sungchul Kang, Mihee Nam, Changwoo Park ,Munsang Kim (KAIST)

This paper describes a new design of blimp having wheeled vehicle part. This system can work both on the ground using wheeled vehicle and in the air using the floating capability of the blimp part. The passive wheeled mechanism in the vehicle part enables the stable taking off, landing on as well as it is greatly helpful to keep a stationary position on the floor. On the other hand, the floating capability enables the wheeled blimp to fly freely regardless of the ground condition or obstacles. The wheeled blimp can be used as an agent robot for the tele-presence application. Using multimedia devices such as camera, speaker, LCD and microphone mounted on the blimp surface, this system can get necessary information at the local site and communicate with person from a distance. As a typical tele-presence application, the wheeled blimp is currently being developed to a tele-guidance robot working in public indoor areas such as exhibition halls, departments, hospitals, etc...

14:40 – 15:00 **I-TP02-6**

Near Minimum-Time Trajectory Planning for Wheeled Mobile Robots with Piecewise Constant Voltages

Jong Suk Choi , Munsang Kim (KIST), Byung Kook Kim(KAIST)

We build near minimum-time trajectory planning algorithm for wheeled mobile robots (WMRs) with piece-wise constant control voltages satisfying i) initial and final postures and velocities as well as ii) voltage constraints We consider trajectory planning problem for cornering motion with a path-deviation requirement for obstacle avoidance. We divide our trajectory planning algorithm for cornering motion into five ordered sections: translational, transient, rota- tional, transient, and translational sections. Transforming dynamics into uncorrelated form with respect to translational and rotational velocities, we can make controls for translational/rotational velocities to be independent. By planning each section with constant voltages, and integrating five sections with adjustment of numbers of steps, the overall trajectory is planned. The performance is very close to the minimum-time solution, which is validated via simulation studies.