D-TA02 Robot Systems 1

08:30-10:30 **Chair : Suh Il Hong (Hanyang Univ.)**
Room : 4128 **Co-Chair : Huh Uk-Youl (Inha Univ.)**

08:30 – 08:50 **D-TA02-1**

Comparative Study on the Stability and the Performance in Bilateral Teleoperation

Kim Jin Wook, Kim Hyung Wook, Yi Byung Ju and Suh Il Hong
(Hanyang Univ.)

Teleoperation is a rapidly progressing field promising to have significant application in space, mining, medical, and other areas. Unfortunately, significant communication delays are expected in teleoperation. With this problem, the two major issues in teleoperation are stability robustness and transparency performance. Recent work in bilateral teleoperation in the two-channel showed that for any two-channel control architecture, stability robustness is enhanced if the feedforward control parameters are lowered. In this paper, we analyze the stability and performance robustness of the three channels control architectures using the passivity-based Llewellyn's absolute stability criterion as wall as the minimum values and Z-width's of the operator and environment transmitted impedances. And the stability and the performance robustness of two and three channels control architectures are quantitatively compared.

08:50 – 09:10 **D-TA02-2**

Development of a Real-time Vehicle Driving Simulator

Kim Hyun Ju, Park Min Kyu, Lee Min Cheoul and You Wan Suk
(Pusan National Univ.)

A vehicle driving simulator is a virtual reality device which makes a human being feel as if the one drives a vehicle actually. The driving simulator is effectively used for studying interaction of a driver-vehicle and developing the vehicle system of new concepts. The driving simulator consists of a motion platform, a motion controller, a visual and audio system, a vehicle dynamic analysis system, a vehicle operation system and etc. The vehicle dynamic analysis system supervises overall operation of the simulator and also simulates dynamic motion of a multi-body vehicle model in real-time. In this paper, the main procedures to develop the driving simulator are classified by 4 parts. First, a vehicle motion platform and a motion controller, which generates realistic motion using a six degree of freedom Stewart platform driven hydraulically. Secondly, a visual system generates high fidelity visual scenes which are displayed on a screen ...

09:10 – 09:30 **D-TA02-3**

Design of Stabilization Algorithm for Unmanned Bicycle

Moon Jiwoon, Lee Sangduck and Ham Woonchul
(Chonbuk National Univ.)

In this paper, research of unmanned electric bicycle based on autonomic traveling is discussed. We derived dynamic equation of bicycle and introduced control theory that bicycle's tilt angle and velocity is stable in some region. We implemented system using DSP processor, accelerometer and DC motor. Then, we carried out an experiment based on studied control theory.

09:30 – 09:50 **D-TA02-4**

Development of an Exclusive Sensor for Detecting Positions of Field Robot Arms

Kim Jong Hwa(Korea Maritime University)
Yang Soon Yong(Univ. of Ulsan)

In order to comprise a basic closed-loop control system for a field robot it is necessary to detect the piston rod stroke of a hydraulic cylinder. There are many conventional type sensors which can detect the displacement of cylinders. However, they cannot reveal the original performance normally or the cannot be applied at all where the operating circumstance of cylinders is beyond specifications of sensors. In this paper, an exclusive method for detecting the piston rod stroke is suggested, which adopts a remote detecting technique using optical fiber sensors. Several experiments using the prototype are executed for verifying the effectiveness of the suggested method and the possibility of the accurate detection of stroke.

09:50 – 10:10 **D-TA02-5**

Forward Velocity Estimation Algorithm for Planar Mobile Robots

Seung-Eun Lee, Wheekuk Kim, Byung-Ju Yi, Bum-Jae You
(Korea Univ.)

The sliding and/ or skidding motions generally occur to a car - like planar mobile robot consisting of four conventional fixed wheels attached on two parallel axles. Thus, the kinematic model of such mobile robot should include the description of skidding and sliding frictional motions. However, most of previous kinematic models do not take these frictional motions into account the kinematic model, as the work done by Muir and Newman [1]. Thus , does it result in least square solution in estimating sensed forward velocity. In this paper, the sensed forward velocity estimation algorithm for mobile robots is proposed, which not only includes those skidding and sliding frictional motions into kinematic model but also utilizes only the minimal set of dependent internal kinematic variables of the mobile robot. Then, ...

10:10 –10:30 **D-TA02-6**

Compliance Control of a Five-bar Mechanism

Kim Chong-Sup, Yi Byung-Ju, Suh Il-Hong(Hanyang Univ.)
Oh Sang-Rok(KIST)

We propose a new compliance control algorithm, which is different from previous compliance control methods in that it employs equal or more actuators than the number of the required compliance elements in operational space. The proposed compliance control algorithm ensures precise force and position control. The validity has been shown both theoretically and experimentally.