D-SA05 Computer Vision/Control

09:00-11:00 **Chair : Sun Geul Lee (Kyunghee Univ.)**
Room : 4134 **Co-Chair : Kim Sang Bong (Pukyong Univ.)**

09:00 – 09:20 **D-SA05-1**

Robot Posture Estimation Using Inner-Pipe Image

Yoon Ji Sup(Korea Atomic Energy Research Institute)
Kang E-sok(Chungnam National Univsersity)

This paper proposes the methodology in image processing algorithm that estimates the pose of the pipe crawling robot. The pipe crawling robots are usually equipped with a lighting device and a camera on its head for monitoring and inspection purpose. The proposed methodology is using these devices without introducing the extra sensors and is based on the fact that the position and the intensity of the reflected light varies with the robot posture. The algorithm is divided into two parts, estimating the translation and rotation angle of the camera, followed by the actual pose estimation of the robot. To investigate the performance of the algorithm, the algorithm is applied to a sewage maintenance robot.

09:20 – 09:40 **D-SA05-2**

Internet-Based Measuring/Monitoring System that Measures Drifted Snow Using Visual Image

Ko Deok Hyeon, Kim Moo Seong(Kyunghee University), Lee Soon Geul and Kim Jin hyung(Taemin Mech)

In this paper, an Internet-based monitoring system is studied which analyzes visual image of drifted snow and measures the amount of snowing. The system is composed with reference ruler where LED's are attached, a camera, and PC with a controller. The length of the ruler is 1.5m and the interval of the LED's is 1cm. The controller synchronizes the on-off control of each LED with the image frame of the camera. When the snow is accumulated along the ruler, the corresponding LED is blocked and the lowest position of the lighted LED is estimated with this captured image of the camera. Because of week intensity of LED light and light rays of outdoors, it is hard to discriminate which LED is blocked due to snow. Image processing method is used to obtain proper resolution and good accuracy. This system ...

09:40 – 10:00 **D-SA05-3**

Stabilization of Attitude for Autonomous Bicycle System Using Sliding Mode Control

Park ingyu and Ham Woonchul
(Chonbuk National University)

In this paper, attitude control of autonomous system using bike based on variable structure control is discussed. Variable structure control is more than a promising technique in the field of nonlinear control. It permits the realization of very robust and simple regulators, with appealing sliding mode characteristics especially if the considered dynamics requires a very short sampling time. We derive dynamic equation of it and demonstrate that the designed controller stabilizes attitude simultaneously regardless of wheel position by computer simulation.

10:00 – 10:20 **D-SA05-4**

Neural-Net Based Nonlinear Adaptive Control for AUV

Li Ji-Hong, Lee Sang-Jeong(Chungnam National University)
Lee Pan-Mook(KRISO)

This paper presents a stable nonlinear adaptive control for AUV(Autonomous Underwater Vehicle) by using neural network.AUV's dynamics are highly nonlinear, and their hydrodynamic coefficients vary with different operational conditions. In this paper, the nonlinear uncertainties of the AUV's dynamics are approximated by using LPNN(Linearly parameterized Neural Network). The presented controller is consist of three parallel terms; linear feedback control, sliding mode control, and adaptive control(LPNN). Lyapunov theory is used to guarantee the stability of tracking errors and neural network's weights errors. Numerical simulations for nonlinear control of the AUV show the effectiveness of the proposed techniques.

10:20 – 10:40 **D-SA05-5**

Reinforcement Learning Algorithm Using Domain Knowledge

Jang Si Young, Suh Il Hong, Kong Sung Hak(Hanyang University)
Oh Sang Rok(KIST)

Q-Learning is a most widely used reinforcement learning, which addresses the question of how an autonomous agent can learn to choose optimal actions to achieve its goal about any one problem. Q-Learning can acquire optimal control strategies from delayed rewards, even when the agent has no prior knowledge of the effects of its action in the environment. If agent has an ability using previous knowledge, then it is expected that the agent can speed up learning by interacting with environment. We present a novel reinforcement learning method using domain knowledge, which is represented by problem-independent features and their classifiers. Here neural network are implied as knowledge classifiers. To show that an agent using domain knowledge can have better performance than the agent with standard Q-Learner. Computer simulations are ...