NANYANG TECHNOLOGICAL UNIVERSITY

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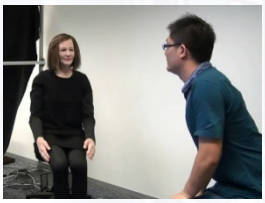
IMI RESEARCH SEMINAR

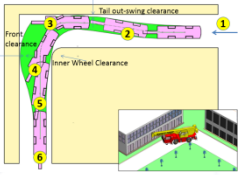
DATE: 20 January 2015, Tuesday
TIME: 11:00 am – 12:30 pm
VENUE: IMI Seminar Room, Research Techno Plaza, XFrontiers, Level 03-01
50 Nanyang Drive, Singapore 637553
*Lunch will be served



Dr ZHANG Zhijun
Research Fellow,
IMI

Real-Time Motion Generation for Humanoid Robot

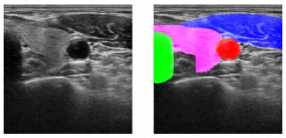
Facing and pointing toward moving targets and dual-arms coordinately working are usual and natural behavior in daily life. Social robots should be able to display such coordinated behaviors in order to interact naturally with people. This is why, a scheme to generate coordinated head-arm motion for a humanoid robot with two degrees-of-freedom for the head and seven for each arm is proposed in this research. Specifically, a virtual plane approach is employed to generate the analytical solution of the head motion. A quadratic program (QP)-based method is exploited to formulate the coordinated dual-arm motion. To obtain the optimal solution, a simplified recurrent neural network is used to solve the QP problem. The effectiveness of the proposed scheme is demonstrated using both computer simulation and physical experiments.



CHEN Yong
PhD Student,
MAE / IMI

Variable Wheelbase Vehicle Path Planning Vehicles Using State Lattice

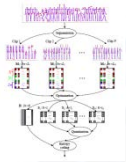
Most vehicles like mobile cranes have more flexible mechanisms so that the wheelbases are able to be changed while driving. Thus, such vehicle of variable wheelbase type makes it more challenging when handling the path planning problems. Also, the nonholonomic constraints and the volume of the vehicle body should also be considered. To address these issues, we adopt a search based method which discretizes the nonholonomic motions to a set of predefined motion primitives. A state lattice is then generated offline according to these motion primitives while collision detection can also be done during the lattice initialization procedure. Given a specific vehicle model, it is also efficient to test the passing capacity of a corridor-like area with a certain resolution.



Subbarao Nikhil NARAYAN
PhD Student,
EEE / IMI

Multi-Organ Segmentation Strategies for 2D Ultrasound Images of the Thyroid Gland

The current trend in Medical Image Processing (MIP) is to research into ways to perform multi-organ detection and segmentation (MDS). The state-of-the-art methods make use of decision trees trained using haar features to perform MDS in imaging modalities such as CT, MRI and Ultrasound, respectively. Such methods require huge databases of annotated datasets for training purposes and acquiring such datasets is an expensive and time consuming affair. Hence, there is an urgent need to research into fast and unsupervised methods to perform MDS. In this talk, one of the methods to perform MDS in an unsupervised manner is presented. This work is a part of an on going research where an attempt is made to investigate into performing automatic landmark based multi organ segmentation and markerless registration of 2D ultrasound image sequences of the thyroid gland.



HOU Junhui
PhD Student,
EEE / IMI

Human Motion Capture Data Tailored Transform Coding

Human motion capture (mocap) is a widely used technique for digitalizing human movements. With growing usage, compressing mocap data has received increasing attention, since compact data size enables efficient storage and transmission. Our analysis shows that mocap data have some unique characteristics that distinguish themselves from images and videos. Therefore, directly borrowing image or video compression techniques, such as discrete cosine transform, does not work well. In this paper, we propose a novel mocap-tailored transform coding algorithm that takes advantage of these features. Our algorithm segments the input mocap sequences into clips, which are represented in 2D matrices. Then it computes a set of data-dependent orthogonal bases to transform the matrices to frequency domain, in which the transform coefficients have significantly less dependency. Finally, the compression is obtained by entropy coding of the quantized coefficients and the bases. Our method has low computational cost and can be easily extended to compress mocap databases. It also requires neither training nor complicated parameter setting. Experimental results demonstrate that the proposed scheme significantly outperforms state-of-the-art algorithms in terms of compression performance and speed.

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