

In the field of intelligent robotics, the International Conference on Intelligent Robots and Systems (IROS) is one of the most prestigious conferences. In this year's event, it was held in Kyoto, Japan.

The conference had many sessions, and I was able to attend a few of them.



SpeedFolding:

The authors state that folding fragments is a long standing challenge in robotic manipulation due to the complex dynamics and high dimensional configuration space of garments. In this work the authors contribute a new neural network architecture that is able to predict pairs of gripper poses to parameterize a diverse set of bimanual action primitives. Using this method they state that their results are state of the art in terms of the speed they can fold the fragment, which they say is 10 times faster. They implement this system on a real robotic arm.

Depth360:

In this work, they estimate the depth of an image in a Simultaneous localization and mapping (SLAM) context using a 360 degree view. This work is an extension of CodeSLAM. In CodeSLAM they trained an Variational AutoEncoder to predict the depth of the image and used 3D constraints to significantly improve this prediction. As I mentioned, they extend it to a 360-degree camera in this work.

Towards Safety-Aware Pedestrian Detection in Autonomous Systems:

Navigation among Movable Obstacles with Object Localization Using Photorealistic Simulation: Navigation Among Movable Obstacles (NAMO) with interaction with the environment is still an open challenge. In this work they present a novel system that handles NAMO using visual feedback. In this work they train and test the system on realistic scenes using NVIDIA Isaac Sim simulations.

## SLAM-Supported Self-Training for 6D Object Pose Estimation

In this work, they offer a novel way to predict the 6 degrees of freedom (6DOF) object pose. Using SLAM they reconstruct the robot's trajectory and object poses. Additionally, they predict object poses using DNN predictive models. Then they integrate both methods using pose graph optimization where they consider the output of the SLAM and the DNN as measurements and they optimize the object pose graph to find the best solution of the object pose.

## Probabilistic Data Association for Semantic SLAM at Scale:

The problem of data association, in the context of SLAM, is finding the right object associated with a given measurement. Wrong association can result in very large errors. In general the number of data associations hypotheses in each time-step is exponential in the number of objects and is growing exponentially with time. In this paper, the author proposes to use the k-best assignment for each measurement landmark pair. They tested their system on the KITTI data set and found it to be effective.

## Hybrid Belief Pruning with Guarantees for Viewpoint-Dependent Semantic SLAM:

I presented my paper as well. In the context of semantic SLAM, the most common semantic observation model is considered viewpoint independent because of computational and complexity limitations, but what if we considered a viewpoint dependent semantic observation model. In this paper we showed how to maintain a posterior belief using such a model and how we can manage the computational limitation in real time.

In general, the IROS conference in Japan was organized very well and it felt that everything was under control. Many more papers and presentations were presented, but I was unable to attend or write about them all. One thing to notice is that the organizers decided that each presentation will be done as follows: each participant recorded the presentation on video before the conference and at the conference we presented with the running video muted as the presentation, which was a little bit challenging. If you have something like that it is my recommendation that you do not record a video with yourself in it and do not add subtitles.