MasterSeminar

Multimodal Temporal Data Processing in Autonomous Driving

M.Sc. Emeç Erçelik  
emece.ercelik@tum.de  
Office 03.07.057

M.Sc. Burcu Karadeniz  
burcu.karadeniz@tum.de  
Office 8111.EG.018
Autonomous driving

• Understanding the surroundings
  • Listing the objects
  • Localizing the objects
  • Estimating the depth
  • Estimating intentions

• Supervised learning
  • Data

Multi-modal data?

- Images
- Multi-view images

Multi-modal data?

• Images
• Multi-view images
• Lidar point clouds

Multi-modal data?

* Images
* Multi-view images
* Lidar point clouds
* Radar


Multi-modal data?

• Images
• Multi-view images
• Lidar point clouds
• Radar
• GPS
• IMU
• ...

Temporal data?

- Sequences of images
- Video
- Sequences of point clouds
- A tensor (nx4xT)
- Sequences of radar feature maps

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Potential advantages of multi-modal data & temporal data?

• More information about the surroundings
• Compensation of data quality in different conditions
• Estimation of the actors’ intention in the environment

• But there is not a single solution to fit everything in one framework
  • Always review the literature
  • Propose own solutions
**Procedure**

1. Choose two topics that are of your interest (18.10.2019)
2. You will get a notification e-mail regarding the assigned topic (18.10.2019)
3. Start looking at the resources and the state-of-the-art papers (18.10-15.11.2019)
4. Initial meeting to discuss the collected materials and expected results (15.11.2019)
5. Each group needs to review at least 4 scientific work
6. Write a seminar paper on your work and submit the first draft (06.12.2019)
7. Present your work (10.01.2020)
8. Submit the final version of your paper (17.01.2020)
9. Write a peer-review on the assigned paper of your peers (31.01.2020)
Topics

1. Sequential multi-modal data processing for **3D object detection**
   - Using RNNs or CNNs (3D)

2. **Object tracking** methods and networks that uses multi-modal data to improve object detection results
   - Tracking of objects in successive frames
   - Association of/matching objects in successive frames

3. Temporal multi-modal data processing for **depth completion** for autonomous driving

4. Temporal multi-modal data processing for **depth prediction** for autonomous driving
Information about the Seminar

• Time and Location: 03.07.011 / 10:00-12:00
• Check the web page of the seminar regularly
Gitlab Repository

• Each group will be granted access to their own repository
• There will be an initial meeting for each group with the supervisor regarding their topic (Date and time will be discussed with the supervisor)
• Update your repository regularly with your work
• All the work should be uploaded to Git Repo before deadlines
• Your access is limited until the final deadline
• After the deadlines, no submission will be accepted
• Please fill in the form with your name, e-mail address and TUMID

• There is a good documentation for Gitlab here
Grading

• Extracting the related state-of-the-art resources (20%)
• Writing a high quality scientific paper (40%)
• Revising and writing a review (10%)
• Presenting the work (30%)

• Attendance to the presentation session is Mandatory
Notes on Plagiarism

• Avoid any kind of Copy & Paste!
• Cite ALL of the scientific works, ideas and the concepts you use!

• What if ...?
• Seminar Grade = 5.0
• The responsible Department at TUM will initial the investigation officially
General Information and Resources (Hyperlinks)

- IEEE latex template for writing scientific papers
- Latex Editor for the final report
- A good reference on How to Write a Scientific Paper
- Your presentation must not be like this!
- A useful tool to manage your references and citations
References


- Depth Completion from Sparse LiDAR Data with Depth-Normal Constraints

- http://www.cvlibs.net/datasets/kitti/eval_tracking.php
- http://www.cvlibs.net/datasets/kitti/eval_depth.php?benchmark=depth_prediction