

Project – Machine Learning for 3D Geometry

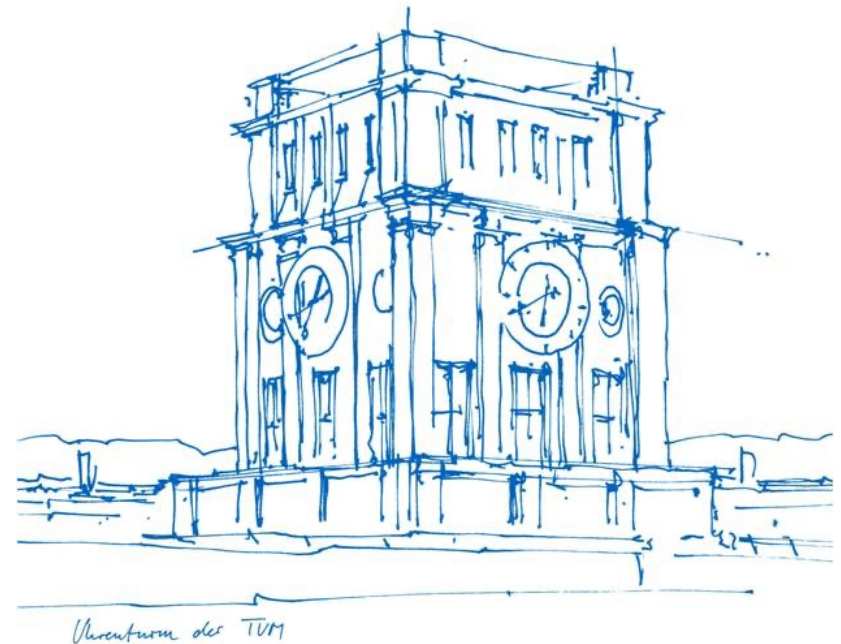
Reconstruction from single 2D Images

Paper: 3D-R2N2: A Unified Approach for Single and Multi-view 3D Object Reconstruction

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Motivation

Traditional methods for 3D shape reconstruction rely on matching observed objects with suitable 3D shape priors, requiring prior knowledge or adaptation. Our reference research paper proposes a novel approach that uses deep convolutional neural networks to learn a direct mapping from observations to underlying 3D shapes without explicit priors. Inspired by LSTM networks and recent advances in single-view 3D reconstruction using CNNs, it introduces the 3D Recurrent Reconstruction Neural Network (3D-R2N2). The network takes one or more images of an object instance and outputs a 3D occupancy grid reconstruction. Importantly, this approach does not require object class labels or image annotations, making it flexible and applicable across diverse objects and scenarios.

Modifications

- Changing encoder to use transformer with attention
- Changing decoder to use transformer with attention
- If there's enough time, try to reverse the process which is 3d to 2d

With our modifications:

1. By incorporating transformer models with attention, we expect improved learning capabilities and better capturing of complex relationships between image features and 3D shapes. The attention mechanisms enable the network to focus on relevant visual cues and align them with reconstructed 3D representations.
2. We expect exploring the reverse mapping from 3D to 2D representations for generating novel object views and reconstructing 2D images from limited 3D information.

Progress

Research and Understanding:

- Thoroughly reading the research paper and making own research
- Running the project code and observing the proposed models

Project setup:

- Creating a GitHub repo for our project, adding initial code and dataset

Workload division and project plan:

- Organize and address the individual tasks and set up a milestone plan

Implementation:

- Dataset preparation and setup completed
- Started encoder and decoder

Progress

