TU Clausthal

# Kolloquium zur Bachelorarbeit

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## „Modeling Quadcopter Dynamics using Recurrent Neural Networks “

Recurent Neural Networks(RNN) has shown its capability to process and predict time series data by storing long-term information. The data collected during the continuous flight of the quadcopter is also time series data, which can be processed by the RNN model. This thesis focuses on the implementation of RNN Long Short-Term Memory (LSTM) model, parameterization and result evaluation, which is used to process and predict quadcopter flight test data as a multivariate time series prediction problem. In this work, we used Crayzflie Nano Quadcopter as a tool for experimental flight data collecting, Keras and TensorFlow as the backend for LSTM model construction, and Mean Square Error (MSE) as metrics of model performance evaluation. In the experiment, we first flew the Crazyflie Nano quadcopter manuelly and collected the control input and acceleration data from Inertial Measurement Unit (IMU), then used the data to train our model and validated its prediction performance using test data different from the training data. By training the model and predicting the test data, the experimental results show that the LSTM model can accurately predict the acceleration of the next-time step, indicating that the LSTM model is an effective tool for quadcopter acceleration predicting and trajectory tracking. For future work, other RNN models, such as Gated Recurrent Units (GRUs), can be tested and their performance compared to the LSTM model to solve such problems.

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