

Abstract:

In this thesis I am working on designing the controller for the non-linear Quadcopter model. The controller is finely tuned using gradient descent method in order to find the best parameters for the controller which guarantees the robustness of the model.

In the beginning of my work, the fundamental equations of motion and forces of the Quadcopter are derived and the design parameters for the given Quadcopter are chosen. I have created a non-linear model for the Quadcopter based on the equation of motion and forces of moment. Generally, the non-linear model will be linearized at a given point. In this thesis work, the model is made to hover at an altitude where the non-linear model is linearized. Based on the inputs, the response of the linear and non-linear model are analysed, it is made sure that both the models behaves in the same manner, if not then the non-linear model and the linearization condition is checked. Once the output for both the model is matched, the research work is further preceded. The controller for the non-linear model is designed and the results are analysed. Finally, the controller is finely tuned using 'Gradient Descent Method' for best controller parameters. I define the 'optimal' set of parameters as vector which minimizes the cost function. In my case, I would like to define a cost function that penalizes high error over an extended duration of time. The best parameter with the effective results for the given Quadcopter is fixed. For the given simulation time, the performance of the Quadcopter model with the optimal controller values are studied by analysing the 3-dimensional visualisation, the Angular velocity and Angular displacement of the model.

The controller is designed in such a way that even if there are any disturbances in the future, the model b

Keywords:

English:

- Quadcopter
- Controller
- Optimal Controller
- PID Tuning
- Matlab
- Simulation

Czech:

- Kvadroptéra
- Kontrolor
- Optimální Kontrolor
- PID Tuning
- Matlab
- Simulace

ehaves well for the given set of inputs and the design parameters.