# Case study

Gruppemedlemmer ( nr. 21 ) :   
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Emnet som jeg gerne vil fordybe mig i er Linear Quadratic Control ( LQR ).

## Linear Quadratic Control (LQR)

Linear Quadratic Control is an alternative to pole placement design. It gives the same controller, u=K x, but instead of placing poles, you penalize states and control inputs relative to each other. Some will say LQR is a more intuitive method, while other prefer the pole-placement method.

LQR is based on some advanced mathematical optimization tools, but is not hard to use. Matlab has good tools to numerically solve all relevant problems (search for the function “lqr).

During the case study, the student undertakes the following activities

* Study the fundamental LQR theory to a degree of being able to apply it in practice
* Designs LQR controllers in Matlab the LEGO car (control position) – with and without the integral effect.
* Test, tune and verify the controller in the Simulink set-up and/or the physical Lego car.
* Documents the theory, the tests and designs with explanations and graphs.

To focus on LQR, you can discarded the observer an just use the discrete derivative to for a state estimate.