MODEL PREDICTIVE CONTROL

CONCLUSIONS

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COURSE STRUCTURE

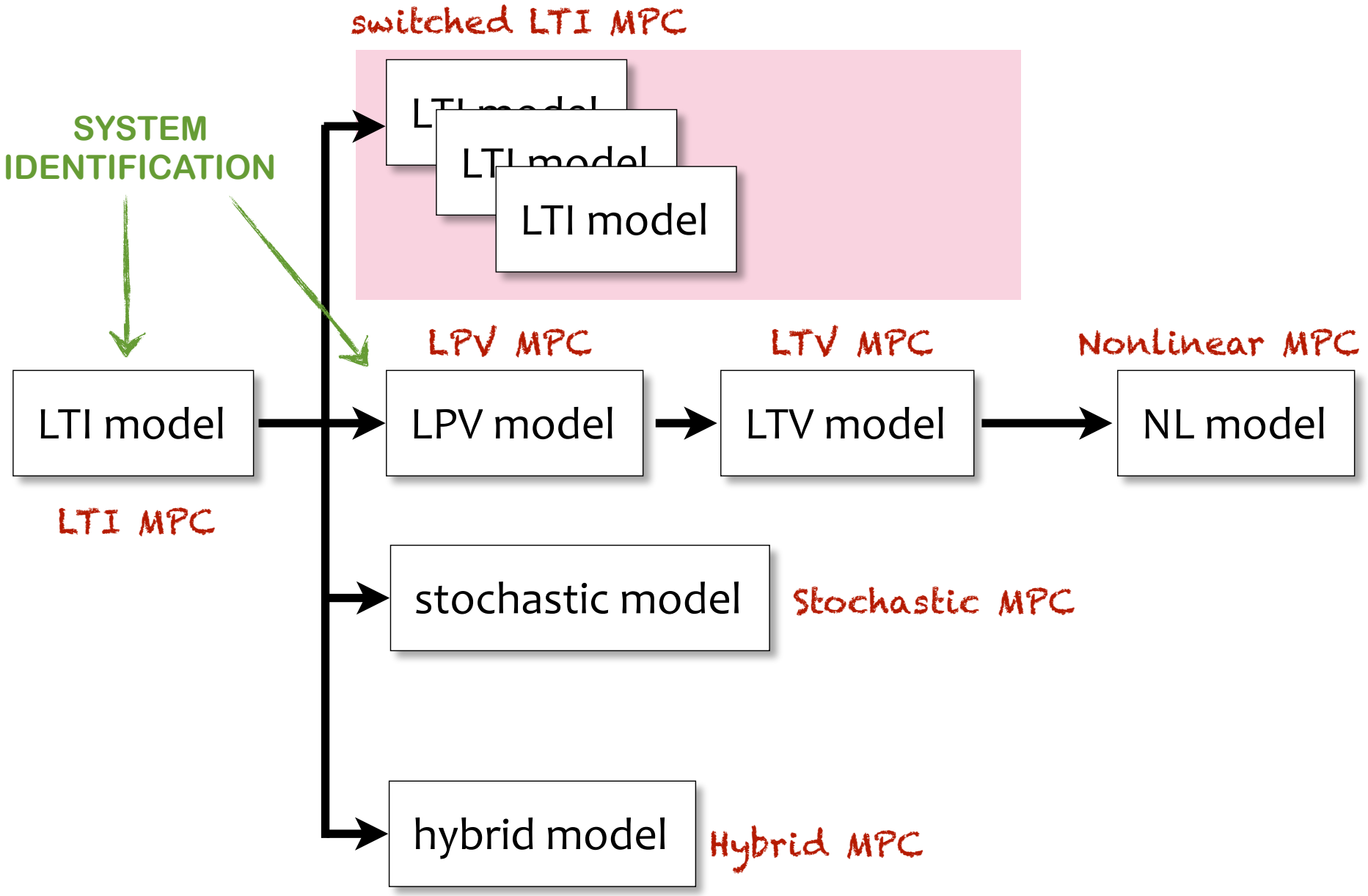
- ✔ **Basic concepts** of model predictive control (MPC) and **linear MPC**
- ✔ **Linear time-varying** and **nonlinear** MPC
- ✔ MPC computations: **quadratic programming** (QP), **explicit** MPC
- ✔ Hybrid MPC
- ✔ Stochastic MPC
- ✔ Data-driven MPC

Course page:

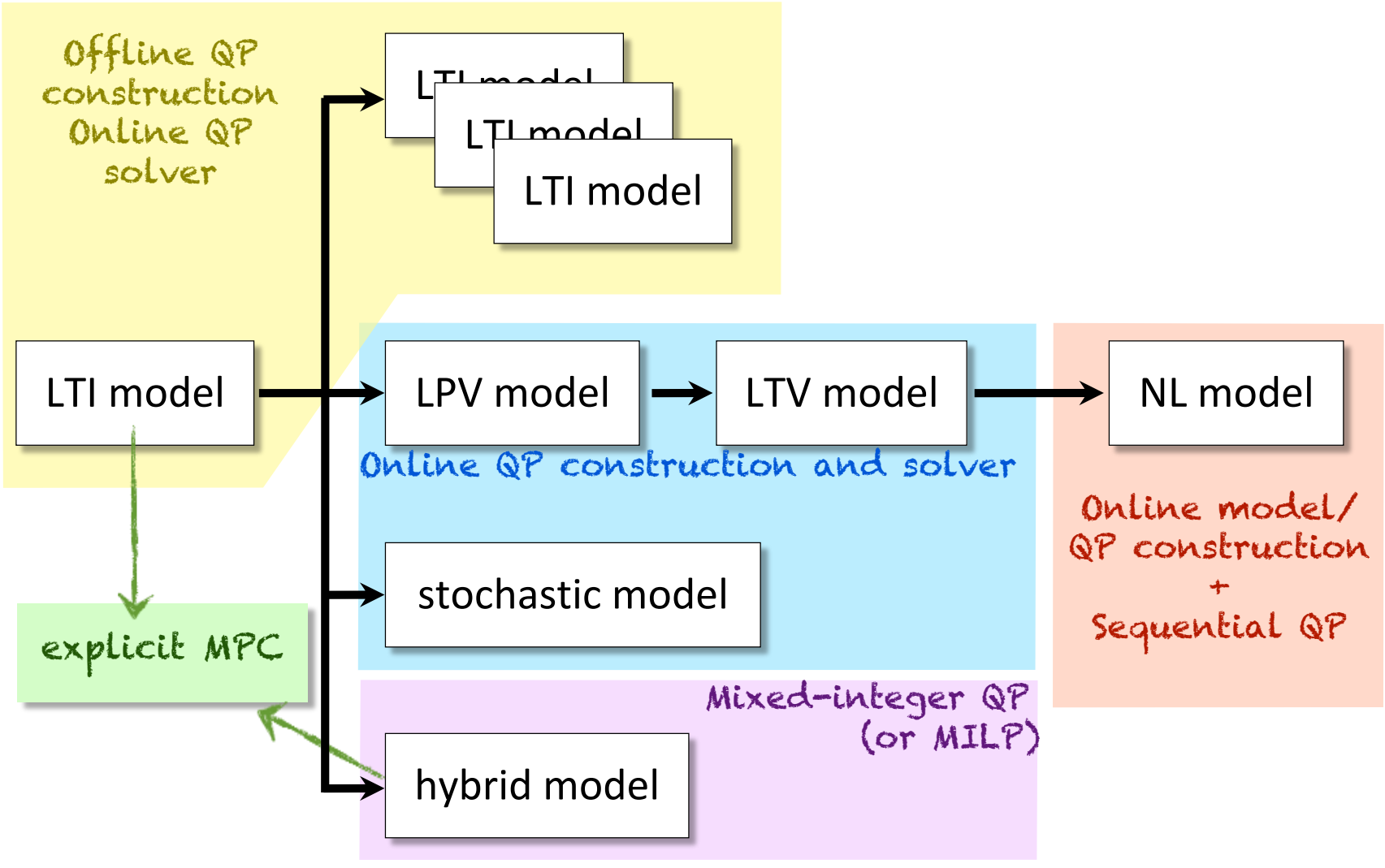
`http://cse.lab.imtlucca.it/~bemporad/mpc_course.html`

CONCLUSIONS

CHOICE OF PREDICTION MODEL



RESULTING OPTIMIZATION PROBLEM



CONCLUSIONS

- MPC is a **universal control methodology**:
  - different **models** (linear, nonlinear, hybrid, stochastic, …)
  - **optimize** closed-loop performance subject to **constraints**
  - **widely applicable** to many industrial sectors
- **MPC research**:
  1. Linear, uncertain, explicit, hybrid, nonlinear MPC: **mature theory**
  2. Stochastic MPC, economic MPC: **still open issues**
  3. Embedded optimization methods for MPC: **still room for many new ideas**
  4. System identification for MPC: there is **a lot to "learn"** from machine learning
  5. Data-driven MPC: **a lot of open issues**.
- **MPC technology**: mature enough for widespread use in industrial applications

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Hybrid systems


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Explicit MPC

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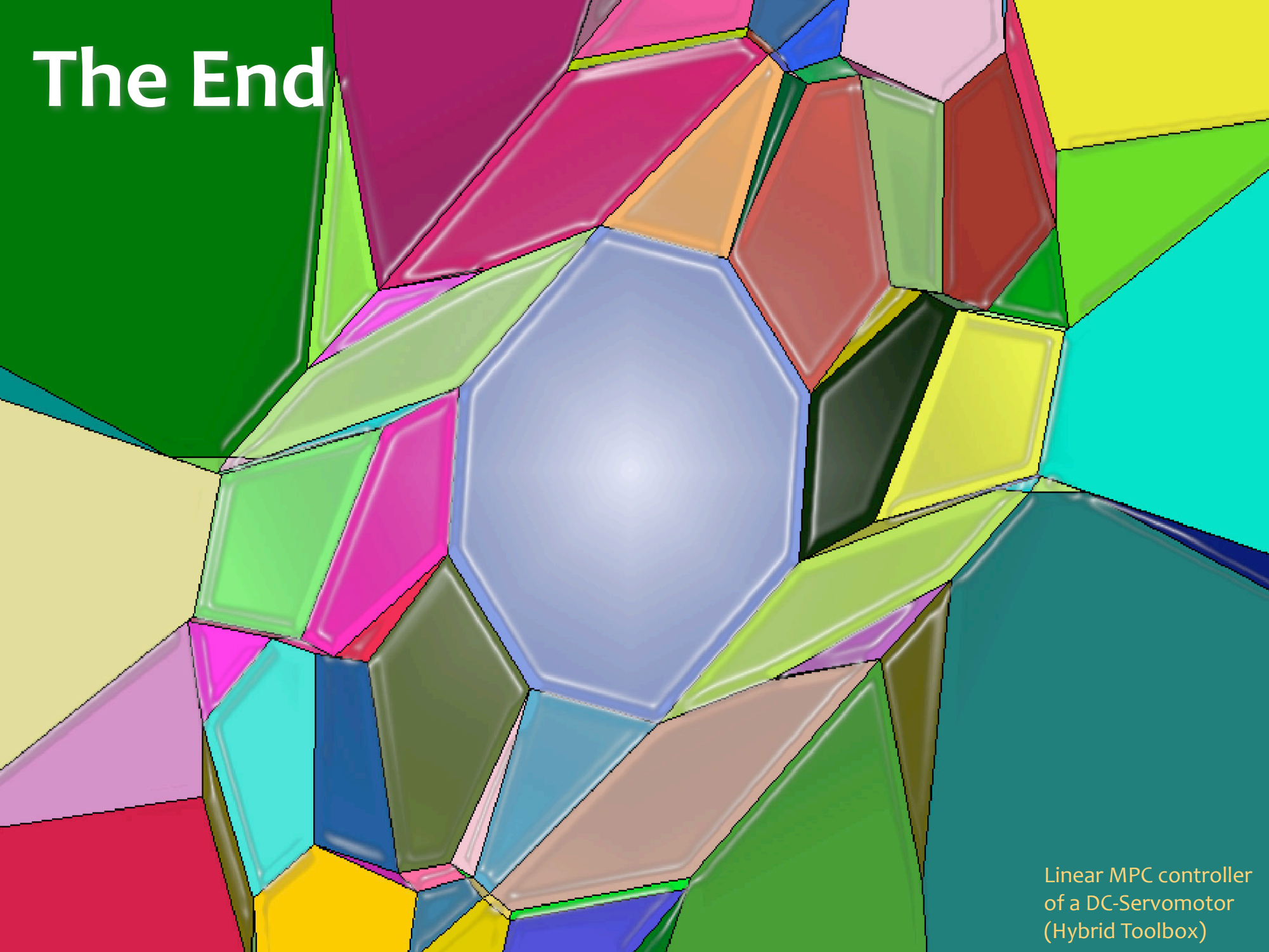

Linear MPC controller
of a DC-Servomotor
(Hybrid Toolbox)