Introduction to Simulink and Stateflow

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Key message

Simulink and Stateflow provide:

- A flexible environment for modelling real systems...
- in a modular fashion...
- that allows rapid development.
Agenda

- Model a DC motor
- Design a PID controller
- Add supervisory logic
Control of a DC Motor

\[ V = K \cdot \omega + i \cdot R + L \frac{di}{dt} \quad \Rightarrow \quad i = \frac{1}{L} \int (V - K \cdot \omega - i \cdot R)dt \]

\[ -T = K \cdot i - b \cdot \omega - J \frac{d\omega}{dt} \quad \Rightarrow \quad \omega = \frac{1}{J} \int (T + K \cdot i - b \cdot \omega)dt \]
What Have We Seen?

\[ i = \frac{1}{L} \int (V - K \cdot \omega - i \cdot R) \, dt \]

\[ \omega = \frac{1}{J} \int (T + K \cdot i - b \cdot \omega) \, dt \]
What Have We Seen?

Rapid prototyping

Modular architecture
What Have We Seen?

Nominal
entry. AngVel = 10;

FailSafe
entry. AngVel = 4, % rad/s

Off
entry. AngVel = 0;

[failMode == false \&\& after(1, sec)]

[after(5, sec)]

[failMode == true]
Key messages

1. Flexible modelling environment

2. Modular, hierarchical design

3. Allows rapid development
Where to from here?

Automatic code generation

Physical modelling

Verification and validation
Any Questions?