

Advanced control layer

MPC

$$u = u^*[0]$$

Basic control layer

Pitch controller (PD)
Elevation controller (PID)

$$\begin{bmatrix} v_d \\ v_s \end{bmatrix}$$

Physical layer

Plant (helicopter)

x



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graph TD; MPC[MPC] -- "u = u*[0]" --> Basic[Pitch controller (PD)  
Elevation controller (PID)]; Basic -- "[ v_d  
v_s ]" --> Plant[Plant (helicopter)]; Plant -- "x" --> Out(( )); Out --> MPC; Out --> Basic;
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The diagram illustrates a three-layer control system for a helicopter. The top layer, 'Advanced control layer', contains the 'MPC' (Model Predictive Control) block. The middle layer, 'Basic control layer', contains the 'Pitch controller (PD)' and 'Elevation controller (PID)' blocks. The bottom layer, 'Physical layer', contains the 'Plant (helicopter)' block. The MPC block outputs a control signal $u = u^*[0]$ to the Basic control layer. The Basic control layer outputs a velocity vector $\begin{bmatrix} v_d \\ v_s \end{bmatrix}$ to the Plant. The Plant outputs the state x , which is fed back to both the MPC and the Basic control layer.