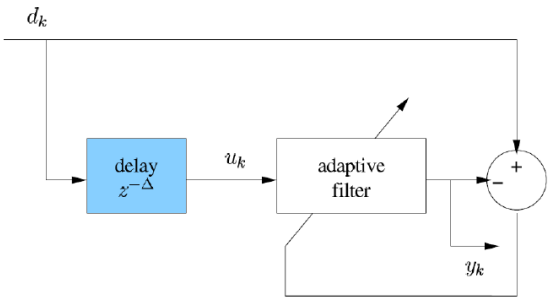
Examples of Quiz 6 questions

* In what kind of situations adaptive filtering is needed?

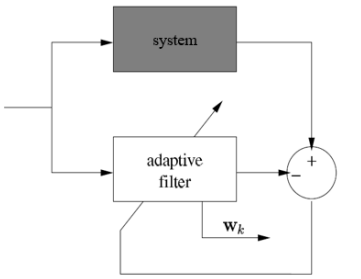
* What causality requirement must hold when adaptive filtering is applied?

* How can the LMS filter be applied to achieve active noise cancellation in headphones?

* For what purpose is the filtering configuration shown on the right used for?

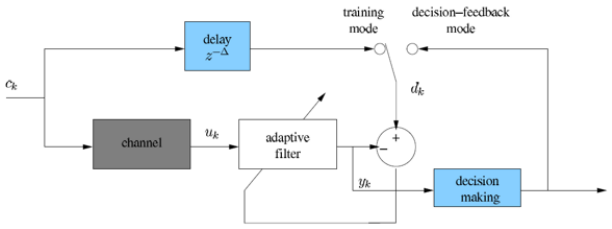


* What is the purpose of the adaptive filtering configuration shown on the right?



Output $\mathbf{w}_k$ = filter coefficients

* Explain how channel equalization configuration shown below works.



* Sketch the structure of adaptive LMS filter and describe how it works.

* In an adaptive filter, the FIR filter has 3 coefficients. At time k = 0, all coefficients are equal to zero, that is, **w**(0) = [0, 0, 0]. Also, the buffer for the reference input contains initially zeros. The first values at the reference input are u(0) = 1, u(1) = -1, u(2) = 3, u(3) = -1, and u(4) = 2. The corresponding values at the primary input are d(0) = -1, d(1) = 2, d(2) = 1, d(3) = 2, and d(4) = -1. Compute the FIR filter coefficient vectors **w**(k) (k=1, ..., 5) to the table below using the LMS algorithm. As a reminder, the coefficient changes in LMS are computed using $2\mu\mathbf{u}(k)e(k)$. Use the step-size μ = 0.1.

k	**w**(k)
0	[0, 0, 0]
1	
2	
3	
4	
5	

* How is the steepest descent solution to Wiener filtering related to LMS adaptive algorithm?

* What is least squares regression and how it is related to RLS algorithm?