

C4 24 T1

$$y(n) = a \cdot y(n-1) + x(n) + 0.9 \cdot x(n-1)$$
$$\left[b^n \varepsilon(n) \rightarrow \frac{1}{1 - b z^{-1}} \right]$$

$$Y(z) = a z^{-1} Y(z) + X(z) + 0.9 z^{-1} X(z)$$

$$Y(z) (1 - a z^{-1}) = X(z) (1 + 0.9 z^{-1})$$

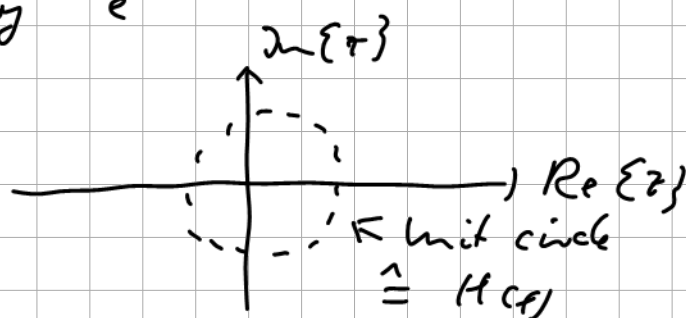
$$H(z) = \frac{Y(z)}{X(z)} = \frac{1 + 0.9 z^{-1}}{1 - a z^{-1}}$$

$$H(f) = \frac{1 + 0.9 e^{-j2\pi f T}}{1 - a e^{-j2\pi f T}}$$

Task $H(z)$ is given, $H(f)$ is wanted:

z is replaced by $e^{j2\pi f T}$

(setting $|z| = 1$)



$h(n) = ?$

$$H(z) = \frac{1}{1 - a z^{-1}} + 0.9 z^{-1} \frac{1}{1 - a z^{-1}}$$

↑ ↑
damping time delay

$$h(n) = a^n \varepsilon(n) + 0.9 \cdot a^{n-1} \varepsilon(n-1)$$

$$h(-1) = 0$$

$$h(0) = a^0 = 1$$

$$h(1) = a^1 + 0.9 \cdot a^0 = a + 0.9$$

mit step $\varepsilon(n) = \begin{cases} 1, & n \geq 0 \\ 0, & \text{else} \end{cases}$

$$h(r) = a^2 + 0.9 \cdot a^1 = a^2 + 0.9 a$$

rough idea of the exam

1 Task	Python	10 Pt	\searrow \searrow \searrow - each with subtasks \searrow - in many cases subtasks can be solved independently
1 Task	chapter 2	10 Pt	
1 Task	chapter 3	10 Pt	
1 Task	chapter 4	10 Pt	
1 Task	surprise	10 Pt	

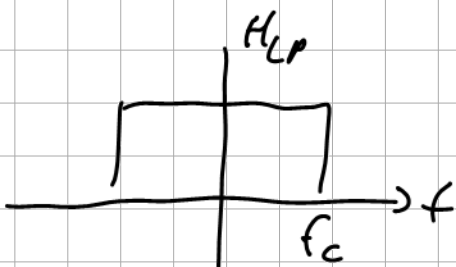
Levenshtein

$s_1 =$ we are in class today.
 $s_2 =$) were in clause 2 day!
 $d = 9$

(Arrows indicate edit operations: blue for deletions, green for insertions, red for substitutions)

Schließen
 statfen

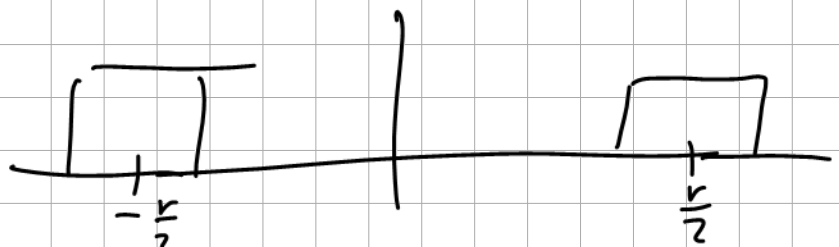
conversion $LP \rightarrow BP$



$$h_{LP} \cdot \cos(2\pi f_m \cdot r) \longleftrightarrow$$

$$H_{LP} * \frac{1}{2} (\delta(f - f_m) + \delta(f + f_m))$$

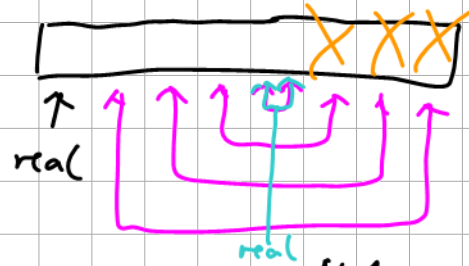
$LP \rightarrow HP$



$$h_{LP} \cdot \cos\left(2\pi \frac{r}{2} \cdot \frac{n}{r}\right) = h_{LP} \cdot \cos(\pi n) = h_{LP} \cdot (-1)^n$$

fft output

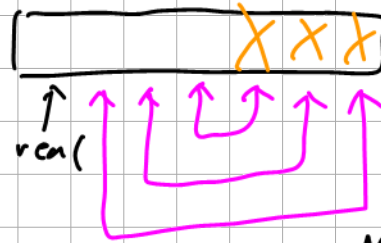
$K=8$



$$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j2\pi \frac{nk}{K}}$$

2 real, $\frac{K}{2} - 1$ complex

$K=7$



$$X(k=0) = \sum_{n=0}^{N-1} x(n)$$

1 real, $\frac{K-1}{2}$ complex













