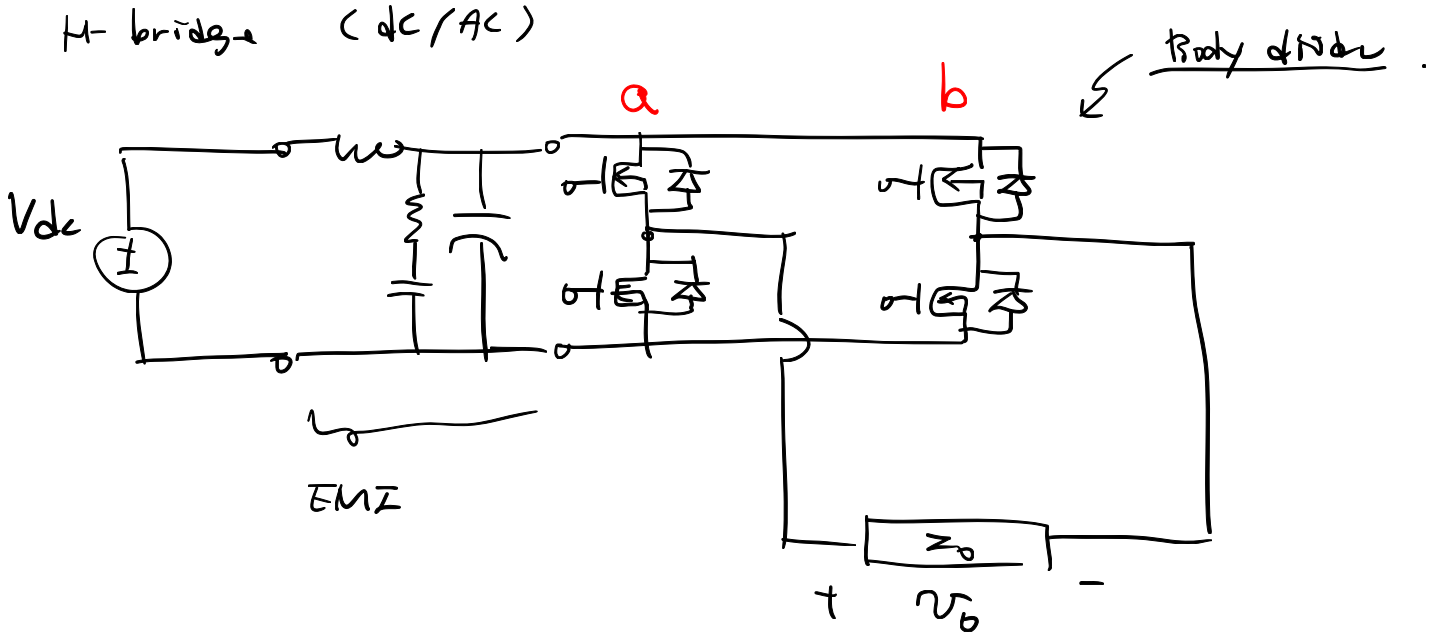
L24 – Switching Amplifier (cont'd)

- H- bridge (dc/AC)



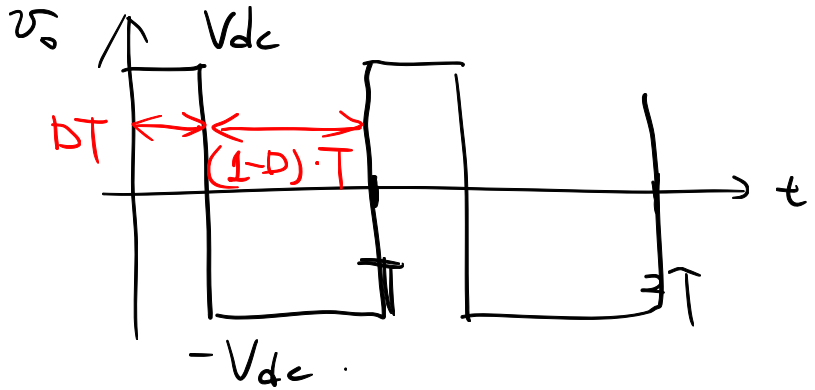
- State table

n	a	b	v_0
0	0	0	0
1	1	0	Vdc
2	0	1	-Vdc
3	1	1	0

V_0 ← 0
V_1 ← 1

"SUM"

- Output waveform.



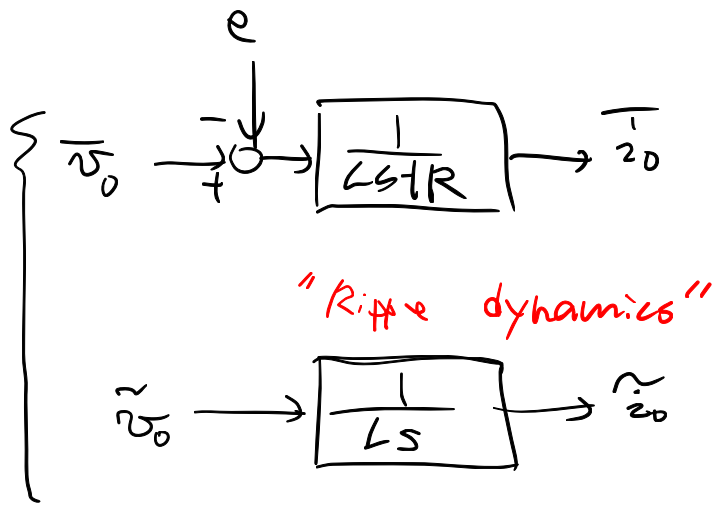
- Duty Ratio Control - $D[k] = u[k]$.

$$\tilde{v}_o = \frac{V_{dc}\, DT - V_{dc}(1-D)T}{T} = (2D-1)\, V_{dc}.$$

$D = 0.5 \rightarrow \tilde{v}_o = 0$ ✓

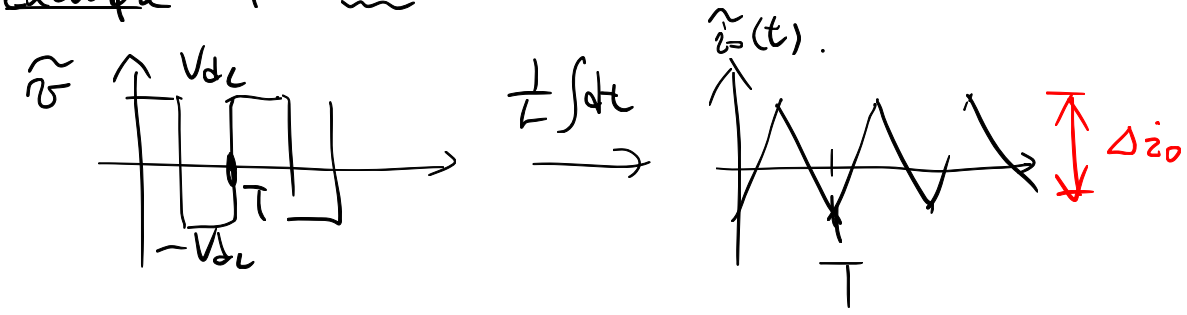
- Current ripple.

$\Rightarrow$



$f_{sw} = 40kHz$

Example $D = 0.5$



$$\Delta i_o = \frac{V_{dc}}{L} \cdot DT$$

$$= \frac{V_{dc}}{2L} \cdot \frac{1}{f_{sw}}$$

$V_{dc} = 30V$
$L = 1.6mH$
$f_{sw} = 40kH$

$\Rightarrow$ ~~15~~ 10 × ~~10^3~~ $\frac{30V}{2 \times 1.6mH} \cdot \frac{1}{40kHz}$. ? A

250mA.

40kHz. → 21kHz?.

- Current ripples.
  - torque ripples. → Vibration,,
  - Core losses. (Hysteresis, eddy-current)
    - Iron losses

- Remedy
  - Insert series inductor. (current slope↓).
  - Increase f_{sw}. (switching loss ↑).