Group 41

TSIU03 - First Presentation

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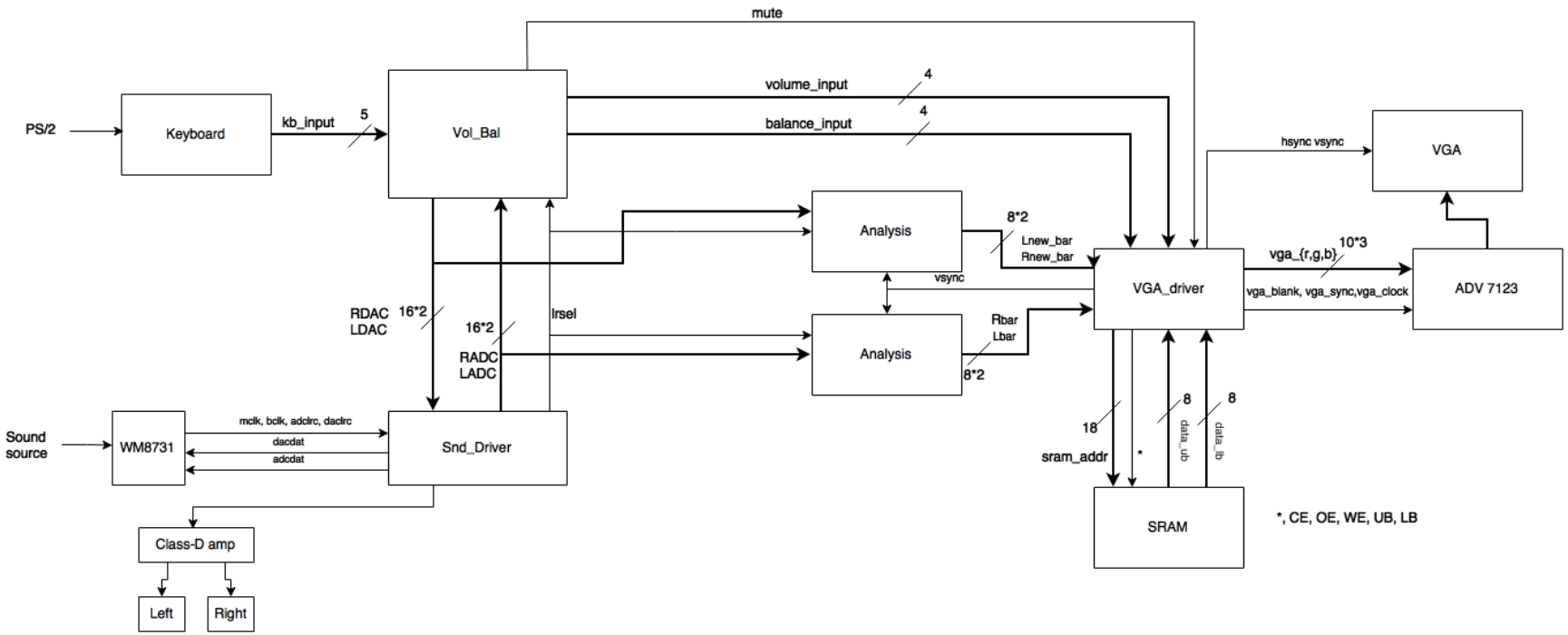
About the Project

- Audio processing
- Keyboard controlled
- VGA-compliant GUI
  - Settings
  - Signal status – Pre- and Post-processing

First Layer of Modules



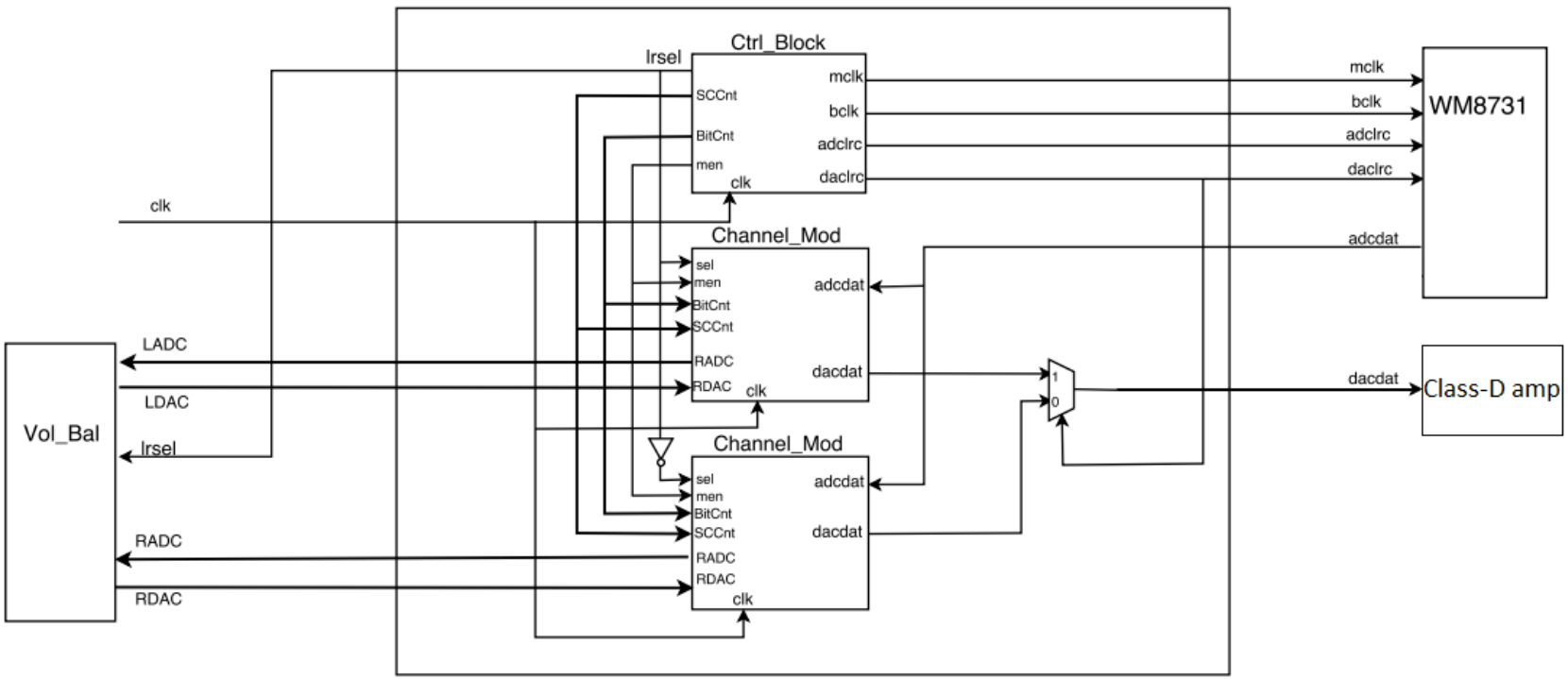
Keyboard

- PS/2 keyboard, *one hot encoded*
- Volume and Balance adjustment, Mute
- Scan codes passed into a '1'-set shift register
  - Once the startbit is shifted out, the 3:rd byte is checked
  - Compare with expected values

KEY	MAKE	BREAK	`kb_input`	Function
U ARROW	E0,75	E0,F0,75	00001	Volume Increase
L ARROW	E0,6B	E0,F0,6B	00010	Balance Bias Left
D ARROW	E0,72	E0,F0,72	00100	Volume Decrease
R ARROW	E0,74	E0,F0,74	01000	Balance Bias Right
END	E0,69	E0,F0,69	10000	Mute Volume

Snd_Driver

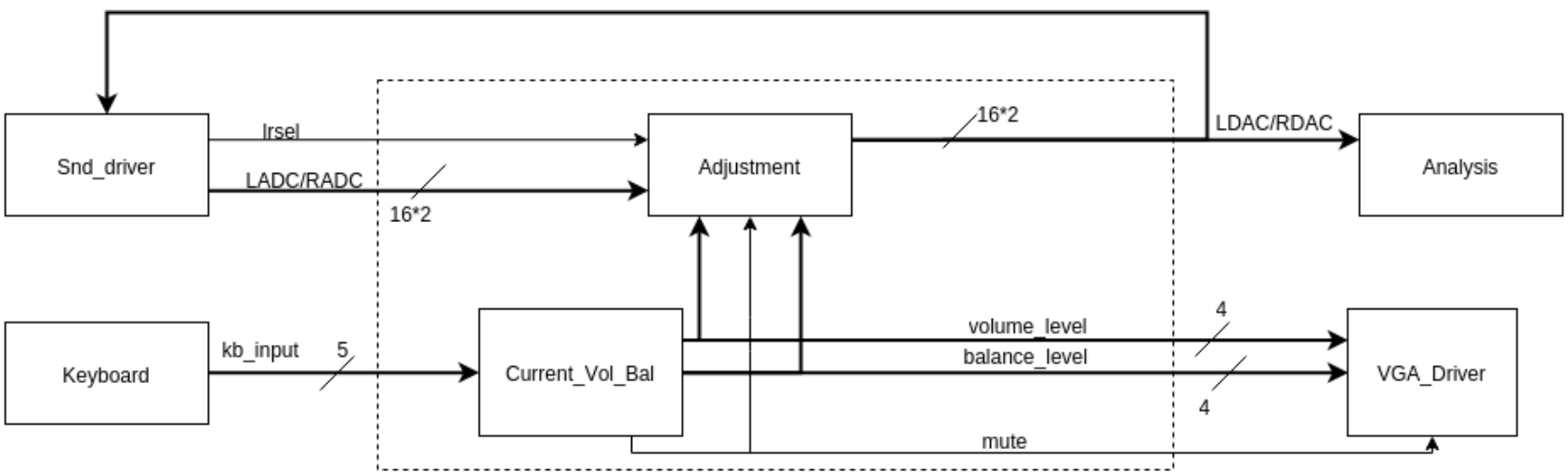
- Identical function as the one in *Lab 4* (`Vol_Bal` replaces `Application`)



Vol_Bal (1)

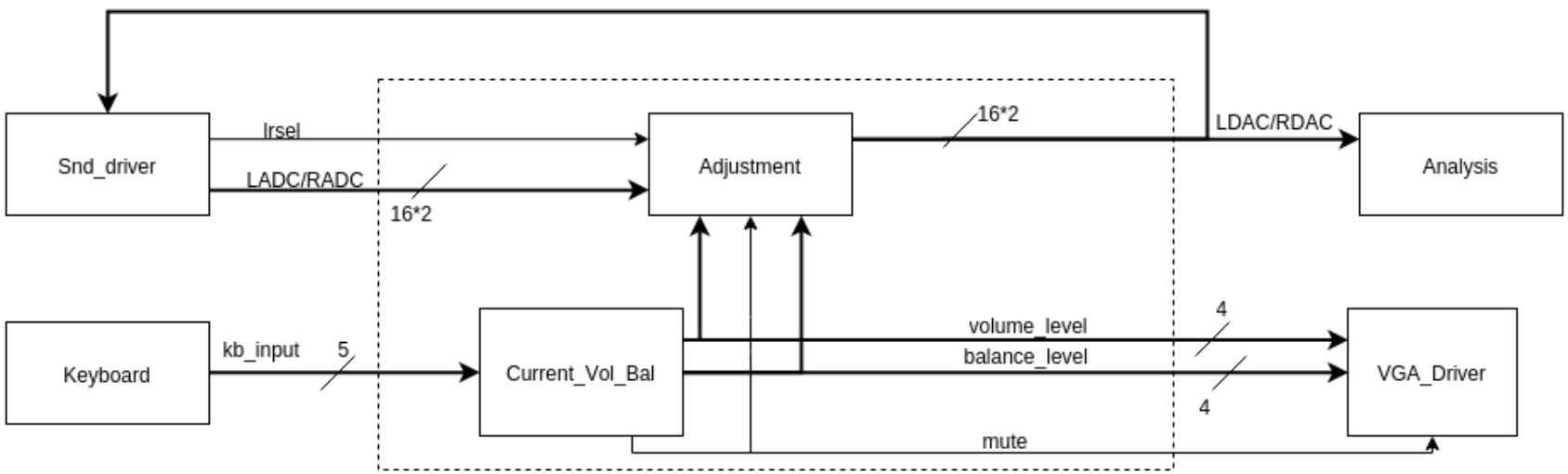
- Sub-module `Current_Vol_Bal` holds current values for volume, balance and mute
- Sub-module `Adjustment`

$$A_{new} = A_{old} \cdot (1/\sqrt{2})^n$$



Vol_Bal (2)

- Decremental adjustment of the output (volume: 0 to (-30) dB, balance: 5 linear steps of bias per channel)
- "Mute" blanks A_{new} values to {L/R}DAC

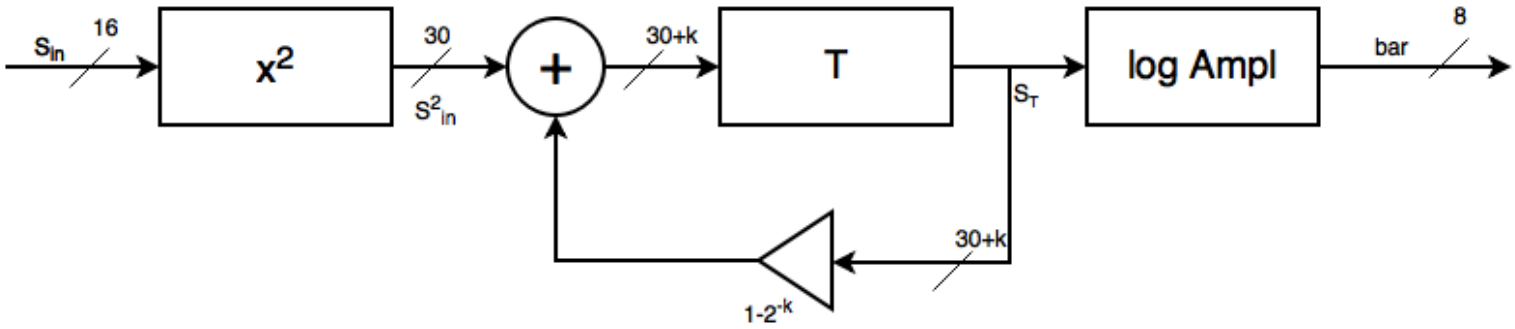


Analysis

- Low pass filtering
- Forward control signals to `VGA_driver`

Name	Type	Description
`lrsel`	input	Channel select
`{L,R}ADC`	input	Left/Right audio input channel
`{L,R}DAC`	input	Left/Right audio output channel
`{L,R}new_bar`	output	Bar amplitude, post-processing
`{L,R}bar`	output	Bar amplitude, pre-processing

Analysis

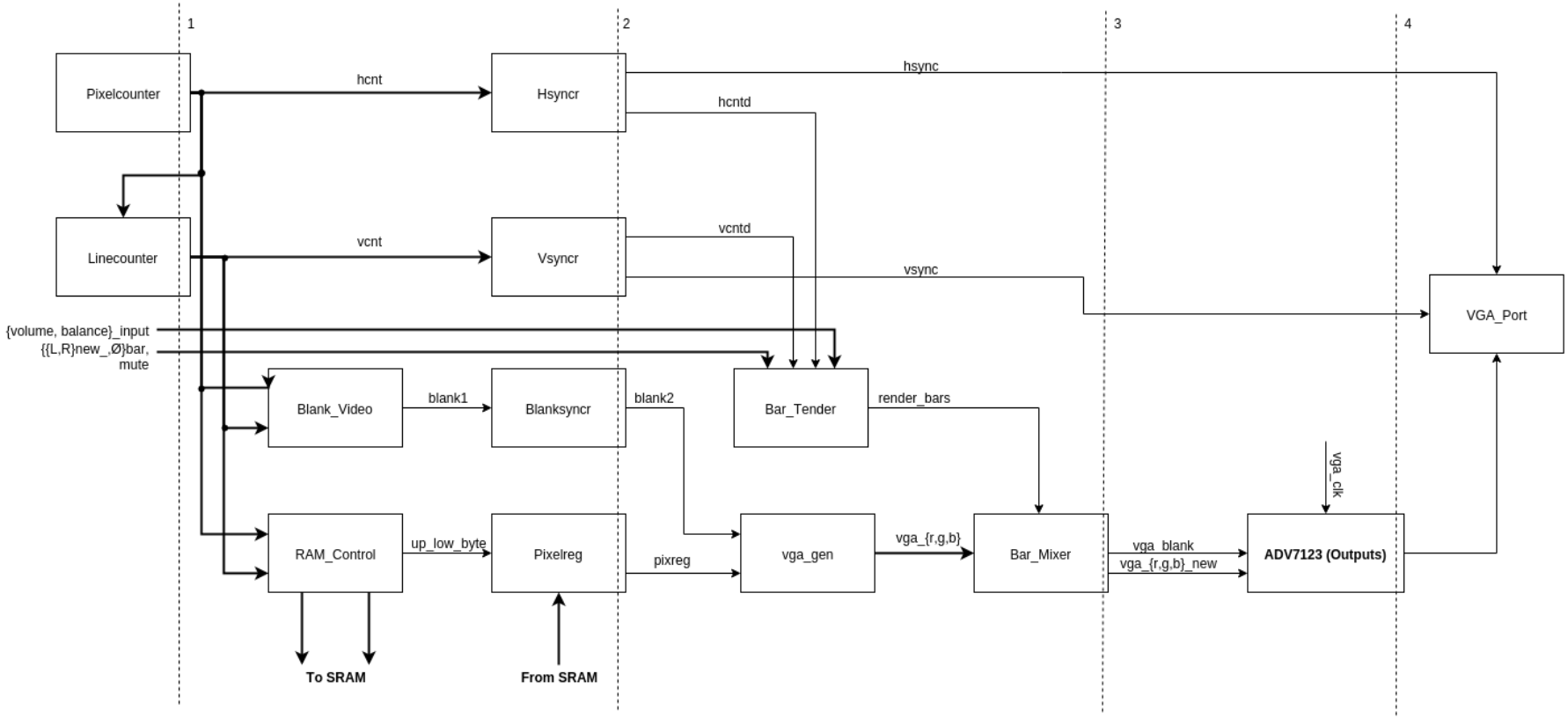


- 100 ms saturation time, k is worked out accordingly

$$\frac{1}{10}\,\mathrm{s} = 2^k \cdot \frac{1}{48800} \Rightarrow 2^k = 4880 \approx 2^{12} \Rightarrow k = 12$$

VGA-driver

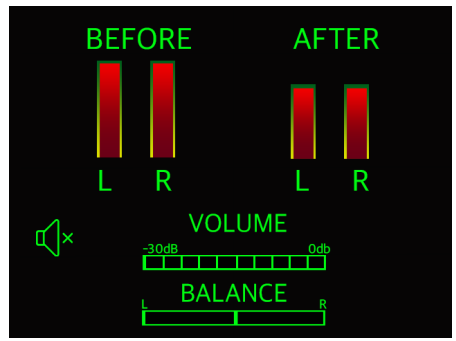
- Similar to *Lab 3*
- New sub-modules: `Bar_{Tender,Mixer}`



VGA-driver

Name	Type	Description
volume_input	Input	A 4-bit input containing vol. info.
balance_input	Input	A 4-bit input containing bal. info.
{L,R}bar	Input	An 8-bit input containing input signal level
{L,R}new_bar	Input	An 8-bit input containing manipulated input signal level
vsync	Output	Control signal for reading the analysis registers

Bar_Tender



- Creates rendering control signal `render_bars` for bar graphs (volume, balance, signal strength pre- and post-processing)
- Background pre-filled bars are blanked out downwards

Bar_Mixer

- Acts as a multiplexer blanking/enabling bar fill through the control signal `render_bars`.