

# Group 41

## TSIU03 - First Presentation

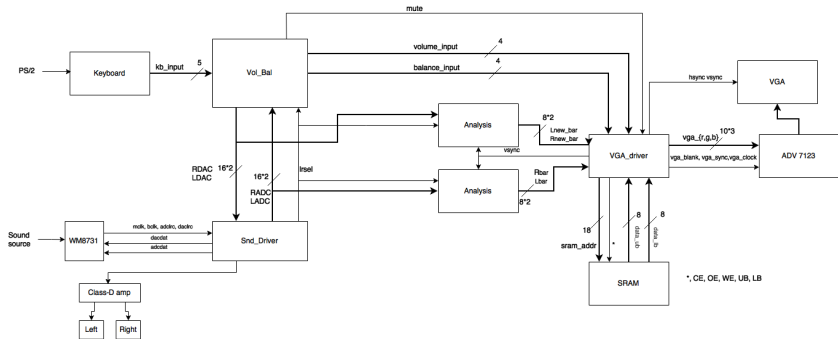
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# About the Project

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

# First Layer of Modules



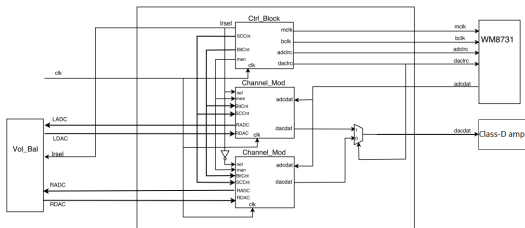
# Keyboard

- ▶ 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)

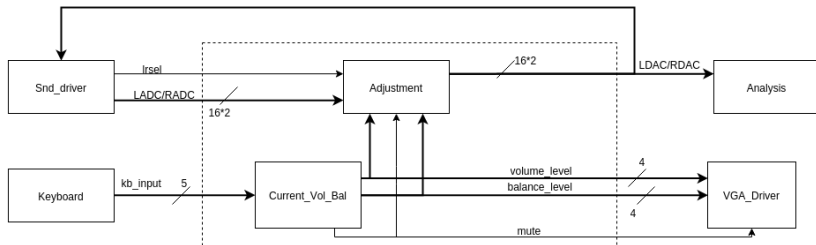


# Vol\_Bal (1)

- ▶ Sub-module Current\_Vol\_Bal holds current values for volume, balance and mute
- ▶ Sub-module Adjustment

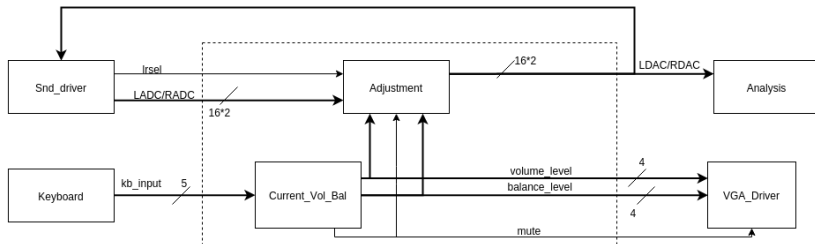
$$A_{l\_new} = A_{l\_old} \cdot (1/\sqrt{2})^{n+m} \quad , \quad m = 0 \text{ for } m < 0$$

$$A_{r\_new} = A_{r\_old} \cdot (1/\sqrt{2})^{n+|m|} \quad , \quad m = 0 \text{ for } m > 0 ,$$



## Vol\_Bal (2)

- ▶ Decremental adjustment of the output (volume: 0 to (-30) dB, balance 0 to (-15) dB per channel)
- ▶ “Mute” blanks  $A_{new}$  values to  $\{L/R\}$ DAC



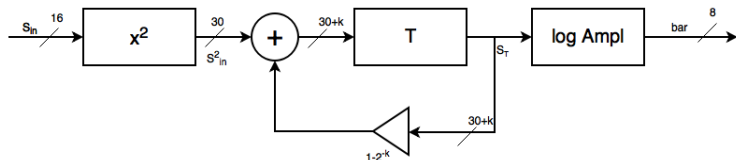
# Analysis

- ▶ Low pass filtering
- ▶ Forward control signals to VGA\_driver

Name	Type	Description
lrssel	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

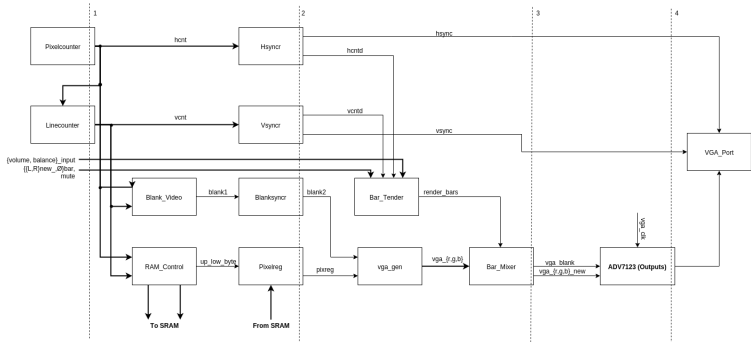


- ▶ 100 ms saturation time,  $k$  is worked out accordingly

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

# VGA-driver

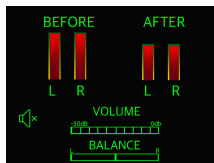
- ▶ Similar to *Lab 3*
- ▶ New sub-modules: Bar\_{Tender,Mixer}



# 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 `renderBars` 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`.

