Features Rundown					
No.	**Feature(s)**	**Owner**	**Input(s)**	**Description**	**Fig.**
1	Basic Voice Scope	Team	SW0	SW0 = '0' – the VGA displays the processed voice waveform (averaging peak samples obtained at a freq. of 200 Hz). SW0 = '1' – the VGA displays a ramp wave (only applicable if the selected waveform type is **normal** – refer to **3.5.3**)	Fig. 1
2.1	LEDs Volume Indicator	Vernon	N.A.	LD9 to LD0 used. Algorithm employed ensures that the LEDs volume indicator's volume level increases (or decreases) **gradually** to the mic's actual volume level recorded (instead of jumping from level to level). Special considerations are also taken to ensure that the LEDs volume indicator is able to react **accurately** to short, loud bursts of voice input.	Fig. 2
2.2	VGA Display	Kah Hwee	N.A.	Grids, x-y axes and ticks are added to the voice scope on the VGA display.	Fig. 3
3.1	7-Segment Display Volume Indicator	Vernon	N.A.	Display volume level on 7-segment display (ranges from 0 to 10).	Fig. 2
3.2.1	Configuration Menu	Team	SW15 BTNL BTNC BTNR	Designed a configuration menu, which allows the user to customise various settings for the volume indicator program. Activated when SW15 = '1'. LED15 will light up correspondingly. The menu is displayed on the 7-segment display, and it can be navigated using the push buttons (BTNL – navigate left, BTNR – navigate right, BTNC – select option).	Fig. 4
3.2.2	Menu on VGA Display	Vernon		The menu is now integrated on the VGA display, allowing an easier navigation through the menu options.	Fig. 5
3.3.1	**LEDs Array** (Volume Refresh Freq.)	Vernon		Allow user to configure the frequency at which the LEDs Array volume indicator updates its current volume level. (DEFAULT: 15 Hz, MIN: 1 Hz, MAX: 50 Hz)	N.A.
3.3.2	**LEDs Array** (Position)	Vernon		Allow user to change how the volume levels are displayed on the LEDs volume indicator (LEFT, RIGHT, CENTER, OFF)	
3.4.1	**7-Segment Display** (Volume Refresh Freq.)	Vernon		Allow user to configure the frequency at which the 7-segment display volume indicator updates its current volume level. (DEFAULT: 10 Hz, MIN: 1 Hz, MAX: 50 Hz)	
3.4.2	**7-Segment Display** (Blinking Freq.)	Vernon		Allow user to configure the refresh (blinking) rate of the 7-segment display. (DEFAULT: 200 Hz, MIN: 50 Hz, MAX: 300 Hz)	
3.4.3	**7-Segment Display** (Display State)	Vernon		Allow user to toggle the display state of the 7-segment volume indicator. (ON, OFF)	
3.5.1	**VGA Display** (Themes)	Kah Hwee		5 themes of pre-set background, grid, and waveform colours to choose from.	
3.5.2	**VGA Display** (Grid Type)	Kah Hwee		3 types of grid display to choose from. (DOTS, LINES, NONE)	
3.5.3	**VGA Display** (Main Waveform Type)	Vernon		3 types of volume waveform to choose from. (NORMAL, BAR, CIRCLE)	
3.5.4	**VGA Display** (Volume Refresh Freq.)	Vernon		Allow user to configure the frequency at which the VGA display volume indicator updates its current volume level. ***Only applicable for the "Bars" and Circle" waveforms***. (DEFAULT: 300 Hz, MIN: 100 Hz, MAX: 1000 Hz)	
3.5.5	**VGA Display** (Volume History Waveform)	Vernon		Allow user to toggle the display state of the volume history waveform. (ON, OFF)	
3.6	Bars Waveform	Kah Hwee	N.A.	-	Fig. 6
3.7	Circle Waveform	Vernon	N.A.	-	Fig. 7
3.8	Volume History Waveform	Vernon	N.A.	Displays the average peak volume recorded over the past 35 seconds.	Fig. 8

Reference:

Derek W. , 2015, VGA-Text-Generator [Online]
Available: https://github.com/Derek-X-Wang/VGA-Text-Generator [Accessed on: 24 October 2018]

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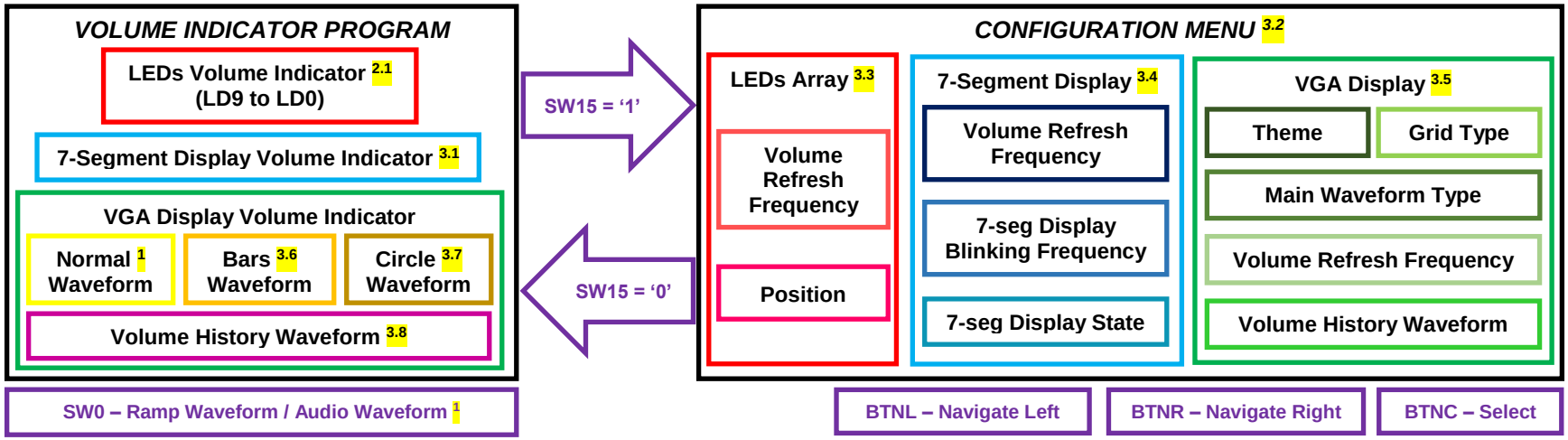

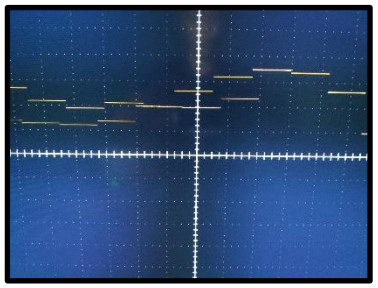

Fig. 1 – Processed Voice Waveform

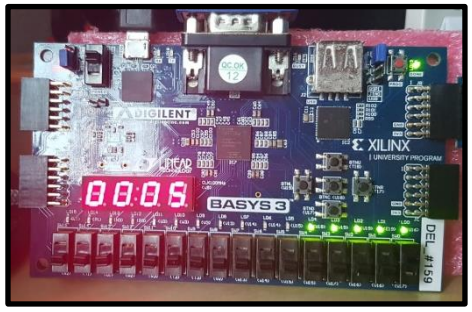

Fig. 2 – LEDs and 7-Segment Display Volume Indicators

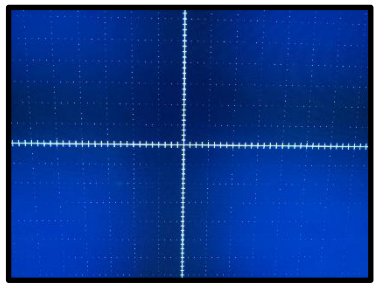

Fig. 3 – Grids, Axes, and Ticks

Fig. 4 – Configuration Menu

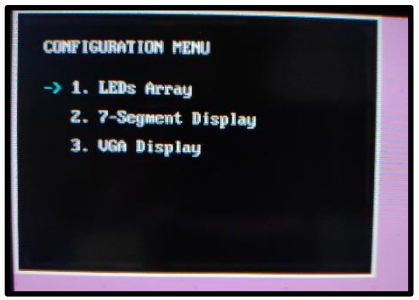

Fig. 5 – Configuration Menu on VGA Display

Fig. 6 – Bars Waveform

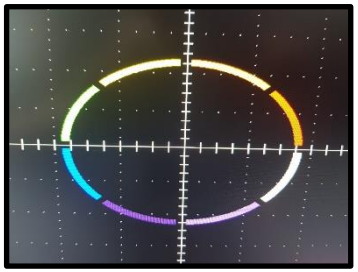

Fig. 7 – Circle Waveform

Fig. 8 – Volume History Waveform