SRI International (Sarnoff)

(Sensei) Technical Report: Distribution A

Sensei: A Multi-Modal Framework for Assessing Stress Resiliency

1 *Update: Technical Progress and Accomplishments for Period 17 (May 2013):*

Task 3.1: Capture Behavioral Stress Markers in Real-Time in Lab Environment with graded exposure to ICT's scenarios   MAC 1-6

During this reporting period, we began data collection using the video clips provided by ICT in the table below.

Table 1. ICT provided clips and rating results

Var	Clip Name	Grp	Code	E1	E2	secs	YouTube Tag	Cod	PSR	Valence
							NON-STRIVE A			
NS A_1	TBFM-MS-COMPANY	NS A	W4U QE	Sadness	Neutral	34	https://www.youtube.com/watch?v=lXX8KSSaHEA	1	0/151	3.11 [1.768]
NS A_2	RES-CS-SNIPER	NS A	4QR76	Anger	Happ/Amu	34	https://www.youtube.com/watch?v=LI6yJUrLgAo	2	0/151	2.79 [1.723]
NS A_3	RES-CS-LOSS	NS A	DN7 D6	Sadness	Anger	38	https://www.youtube.com/watch?v=0Qct25KYe04	3	4/151	1.4 [1.630]
NS A_4	TBFM-CS-CLOSE	NS A	PX21 A	Happ/Amu	Surprise	39	https://www.youtube.com/watch?v=W9IMv_Yuk0s	4	0/151	4.14 [1.901]
NS A_5	RES-CS-HIGH	NS A	2VW 89	Happ/Amu	Sadness	16	https://www.youtube.com/watch?v=3ardFYHZqDM	5	1/151	3 [1.456]
						161	2.683			
							STRIVE A			
SA_1	STRIVE-CS1-KANYE	SA	T84P 3	Happ/Amu	Surprise	38	https://www.youtube.com/watch?v=gtEYJvAPYWc	1	0/151	3.66 [1.510]
SA_2	STRIVE-CS1-BISCUIT	SA	DF22 K	Happ/Amu	Disgust	20	https://www.youtube.com/watch?v=jOK3No6V0X4	2	1/151	3.25 [1.507]
SA_3	STRIVE-CS1-DISNEY	SA	MGO 98	Happ/Amu	Fear	17	https://www.youtube.com/watch?v=Njpb15ET5ps	3	0/151	3.48 [1.311]
SA_4	STRIVE-CS1-LOOKOUTS	SA	33LL 9	Fear	Anger	25	https://www.youtube.com/watch?v=UCZNjNQc-8k	4	1/151	3.1 [1.258]
SA_	STRIVE-	SA	M792	Surpris	Fear	38	https://www.youtube.com/watch?	5	0/15	1.96

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ID	Name	Type	Code	Emotion A	Emotion B	N	URL	#	Frac	Value
5	CS1-IED		Z	e			v=uBQfld69k8c		1	[1.531]
SA_6	STRIVE-MS1-FIELDTEST	SA	5TQ32	Happ/Amu	Neutral	24	https://www.youtube.com/watch?v=YSZ66-j3oqU	6	2/15 1	3.91 [1.348]
						162	2.700			
				NON-STRIVE B						
NSB_1	TBFM-CS-TINY	NSB	3WGV1	Happ/Amu	Sadness	35	https://www.youtube.com/watch?v=zFTIfqL3hqs	1	0/15 1	3.12 [2.003]
NSB_2	RES-CS-IED	NSB	Y94H3	Surprise	Fear	28	https://www.youtube.com/watch?v=WEXVe9bMxyk	2	0/15 1	1.76 [1.565]
NSB_3	TBFM-MS-LOSS	NSB	J8V68	Sadness	Anger	38	https://www.youtube.com/watch?v=wnyUlR7ZFFI	3	0/15 1	1.91 [1.558]
NSB_4	TBFM-CS-FF	NSB	G3FFO	Anger	Surprise	32	https://www.youtube.com/watch?v=yn3p26w9X2Y	4	0/15 1	2.25 [1.448]
NSB_5	RES-CS-CONFIRMED	NSB	P6M44	Happ/Amu	Disgust	42	https://www.youtube.com/watch?v=ylWYOFj_LqM	5	2/15 1	2.4 [2.185]
						175	2.917			
				STRIVE B						
SB_1	STRIVE-MS1-SERGEANT	SB	UV94A	Sadness	Surprise	14	https://www.youtube.com/watch?v=Agz2DgT1sN8	1	0/15 1	3.91 [1.227]
SB_2	STRIVE-CS2-HANDS	SB	IB3G3	Happ/Amu	Neutral	37	https://www.youtube.com/watch?v=X6mbt3LXqK0	2	0/15 1	3.45 [1.389]
SB_3	STRIVE-CS2-FRIEND	SB	8EI4W	Happ/Amu	Surprise	20	https://www.youtube.com/watch?v=iHPsYEmodtw	3	0/15 1	4.28 [1.397]
SB_4	STRIVE-CS2-SOUP	SB	H8L93	Happ/Amu	Surprise	38	https://www.youtube.com/watch?v=_7Owp6ZG1YA	4	0/15 1	3.83 [1.262]
SB_5	STRIVE-CS2-KALIL	SB	48X92	Surprise	Happ/Amu	32	https://www.youtube.com/watch?v=tCiWwQxXByM	5	1/15 1	2.76 [1.242]
SB_6	STRIVE-CS2-IED	SB	23ZO7	Surprise	Disgust	39	https://www.youtube.com/watch?v=vgRVswwjZlc	6	0/15 1	1.15 [1.643]

Each session began with a two minute relaxing video from the same set as we used previously, in the Stroop experiments.

Then, each of the four blocks listed in the table (i.e., Non-Strive A, Strive A, Non-Strive B, Strive B) were presented, with all the sequences shown contiguously within the block, and a thirty second relaxing video refresher between blocks.

Different subjects are being shown one of four different block orders, as indicated below and in the ICT spreadsheet.

Non-STRIVE A --> STRIVE A --> Non-STRIVE B --> STRIVE B
STRIVE B --> Non-STRIVE B --> STRIVE A --> Non-STRIVE A
STRIVE A --> Non-STRIVE A --> STRIVE B --> Non-STRIVE B
Non-STRIVE B --> STRIVE B --> Non-STRIVE A --> STRIVE A

In our experiment, the relaxing video was also shown at the end of the four blocks, but with a twist: a loud woman's scream occurs on the soundtrack a minute into the sequence.

Figure 1 below shows some typical results, in this case of the raw GSR signal, with up in the plot indicating a higher stress level. The light blue shaded areas on the plot indicate phases within which the relaxing beach video was presented; all other are labeled according to the block: NSA, SA, NSB, SB.
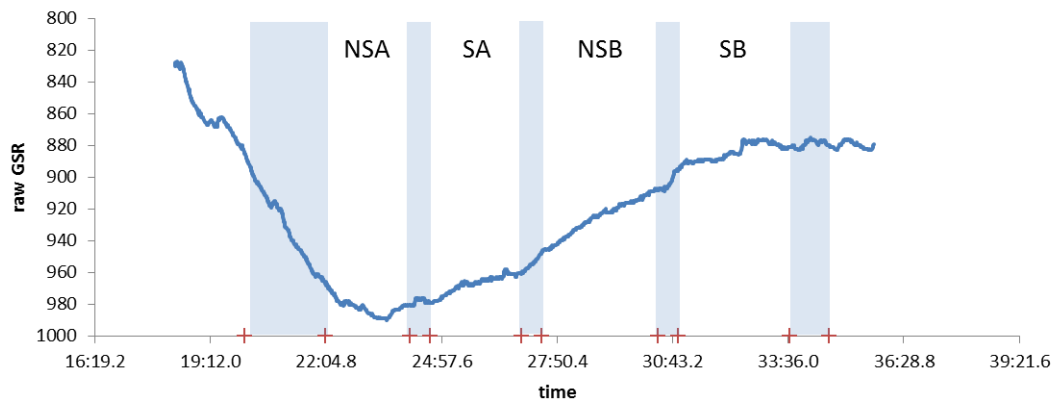

Figure 1. Results on video clip responses

One potentially interesting analysis is to try to correlate the observed stress responses, as in Figure 1, with the reported emotional valence from ICT's subjective rating experiment. For example, one could observe the change in GSR value from beginning to end of a sequence block as an indication of the incremental stress value of that block, and see if this tracks the valence. For the subject in Figure 1, for example, the largest stress increment is in NSB, which is also observed to have the lowest average negative valence of the four blocks in the ICT results. More definitive analyses await more subjects this month.

We have also refined the temporal derivative IIR filters reported last month, as we were finding that the number of filter stages and calculations was growing inordinately large considering the range of time scales in which we are interested (i.e., up to on the order of 30 seconds per lobe). For this purpose, we are now using a cascade of single delay recursive filters, but with the delay increasing by a power of two at each subsequent scale. This power of two condition then enables us to also downsample in time by an additional factor of two at each scale, resulting in major computational and storage savings without loss of resolution, since the downsampling is matched to the passband of each filter; i.e., it is a temporal pyramid, analogous to the Burt spatial pyramid. The temporal derivatives are computed, as before, by taking the difference in consecutive stages of the IIR lowpass cascade.

Figure 2 below shows the impulse responses of the lowpass operators computed from the first five stages of the pyramid. Note the reduction in the number of samples for each subsequent stage.
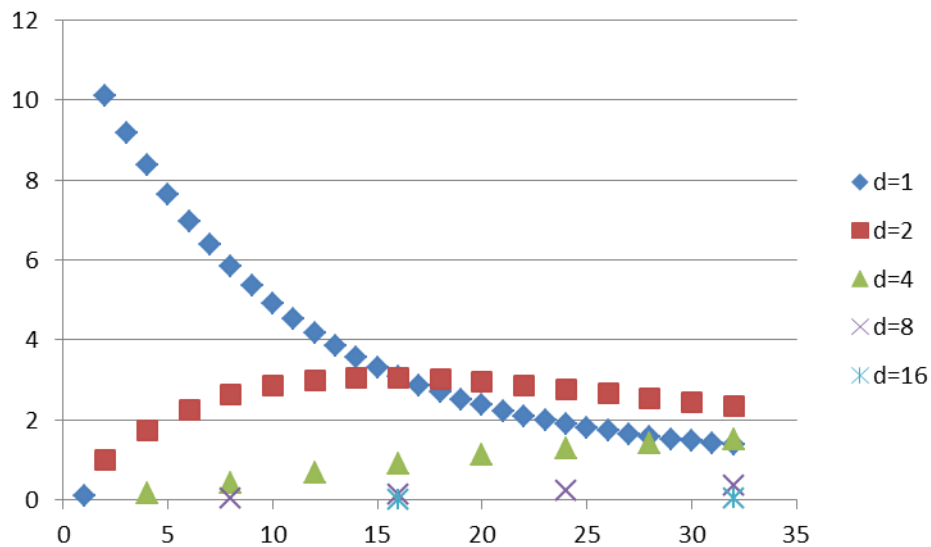

Figure 2. Impulse response of IIR cascade pyramid

Task 3.2: Administer Scenarios and Verify Hypothesis   **MAC 6-12**
Not yet at this stage.
Task 3.3: Program Management   **MAC 1-12**

2. *Issues:*
- No current issues.

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