Temperature Analysis Profile

This program analyzes the temperature of raw environmental test data for automotive lighting systems. The tests expose lighting systems to various temperature profiles while the systems are powered. The primary function of this project is to detect if the changing of temperature of each sample and the ambient is as consistent and regular as the particular and regular changed temperature condition.

Input Raw Data Sample

1. Thermal Shock data (CSV.)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Sweep #	Time	Chan 101 (	Chan 102 (	Chan 103 (	Chan 104 (	Chan 105 (	Chan 106 (	Chan 107 (	Chan 108 (	Chan 109 (	Chan 110 (	Chan 111 (	Chan 112 (C)
2	1	02/02/200	-39.67	-36.88	-39.16	-38.98	-38.57	-38.00	-38.64	-38.85	-39.22	-38.58	-38.60	-39.23
3	2	02/02/200	0.71	-21.09	-20.88	-19.07	-30.03	-23.05	-7.16	4.02	-5.03	-19.62	-0.94	-32.58
4	3	02/02/200	41.51	-9.48	-5.90	-1.35	-19.17	-6.09	11.60	32.44	19.63	-2.16	34.37	-22.41
5	4	02/02/200	62.64	-1.90	6.50	12.53	-9.15	8.15	24.15	50.90	37.16	13.32	58.98	-11.98
6	5	02/02/200	75.47	5.01	18.25	24.16	0.20	20.52	34.44	66.14	51.61	27.72	76.56	-2.82
7	6	02/02/200	81.49	10.23	26.76	32.85	8.11	30.11	40.21	75.39	61.89	38.97	86.71	5.64
8	7	02/02/200	85.29	14.79	35.49	40.49	15.56	38.18	46.55	83.57	70.48	49.10	93.83	13.81
9	8	02/02/200	88.05	18.90	42.56	47.72	22.25	44.71	51.97	90.08	77.23	57.66	98.75	21.75

(And so on…)

2. PTC data (CSV. or TXT.)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Date	Time	Amb Tem	TC2	TC3	TC4	VSetpoin	VSense 1	VSense 2	Board on	TP1: Syste	TP2: Syste	TP3: Syste	TP4: Syste	TP5: Syste	TP6: Syste	TP7: Syste	TP8: Syste	TP9: Syste	TP10: Sys	TP11: Sys	TP12: System 93	
2	2/6/2017	6:50:57 PM	-42.518	-42.032	6.50E+34	-42.125	9	0.003	0.003	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
3	2/6/2017	6:51:03 PM	-42.594	-42.025	6.50E+34	-42.146	9	0.003	0.003	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
4	2/6/2017	6:51:09 PM	-42.702	-42.049	6.50E+34	-42.132	9	0.004	0.003	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
5	2/6/2017	6:51:15 PM	-42.777	-42.042	6.50E+34	-42.129	9	0.004	0.004	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
6	2/6/2017	6:51:21 PM	-42.842	-42.056	6.50E+34	-42.143	9	0.003	0.003	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
7	2/6/2017	6:51:27 PM	-42.889	-42.042	6.50E+34	-42.163	9	0.004	0.005	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
8	2/6/2017	6:51:33 PM	-42.918	-42.063	6.50E+34	-42.16	9	0.003	0.004	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
9	2/6/2017	6:51:39 PM	-42.921	-42.056	6.50E+34	-42.19	9	0.005	0.005	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	

(And so on…)

Current Limits

This program can only analyze the cycles that can reach the threshold, but will leave those cycles cannot reach as blank.

Core Functions

1. Temporal Plotting

2. Summary Tables with basic statistics

- List out outrage data (Usually because of reading errors or opened thermal couple)
- Statistic summary of all the cycles
- List out all the calculate result of each cycle: (the attributes listed as below)
    - Cold_soak_duration_minute
    - Cold_soak_mean_temp_c
    - Cold_soak_max_temp_c
    - Cold_soak_min_temp_c
    - Hot_soak_duration_minute
    - Hot_soak_mean_temp_c
    - Hot_soak_max_temp_c
    - Hot_soak_min_temp_c
    - Down_recovery_time_minute
    - Down_RAMP_temp_c
    - Down_RAMP_rate_c/minute
    - Up_recovery_time_minute
    - Up_RAMP_temp_c
    - Up_RAMP_rate_c/minute

Introduction

1. Gui
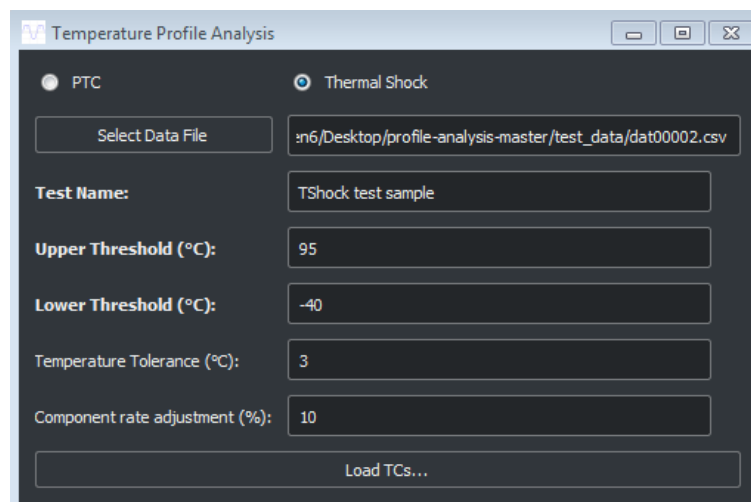
- In this interface, user give the input of this program.
- Choose the raw testdata file and the type of this test.
- Give a name or discription to this datafile over Test Name box.
- Input the Upper & Lower Threshold, and Temperate Tolerance.
- Input Component rate adjustment if it exists.

- In this interface, this program can detect there are how many channels in this test.
- User can label out which channel is the Ambient.
- Give a brief description for each channel or leave it blank.
- All of these brief labels will show in the tab of output excel file.
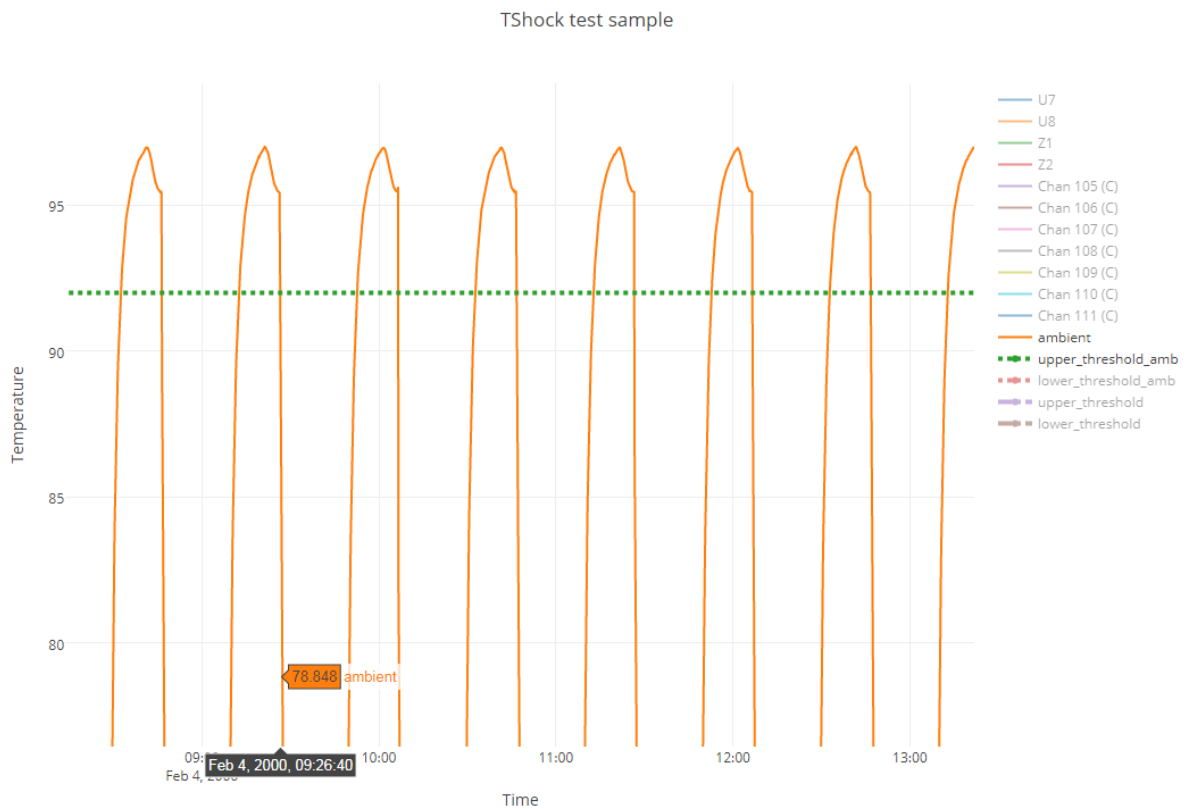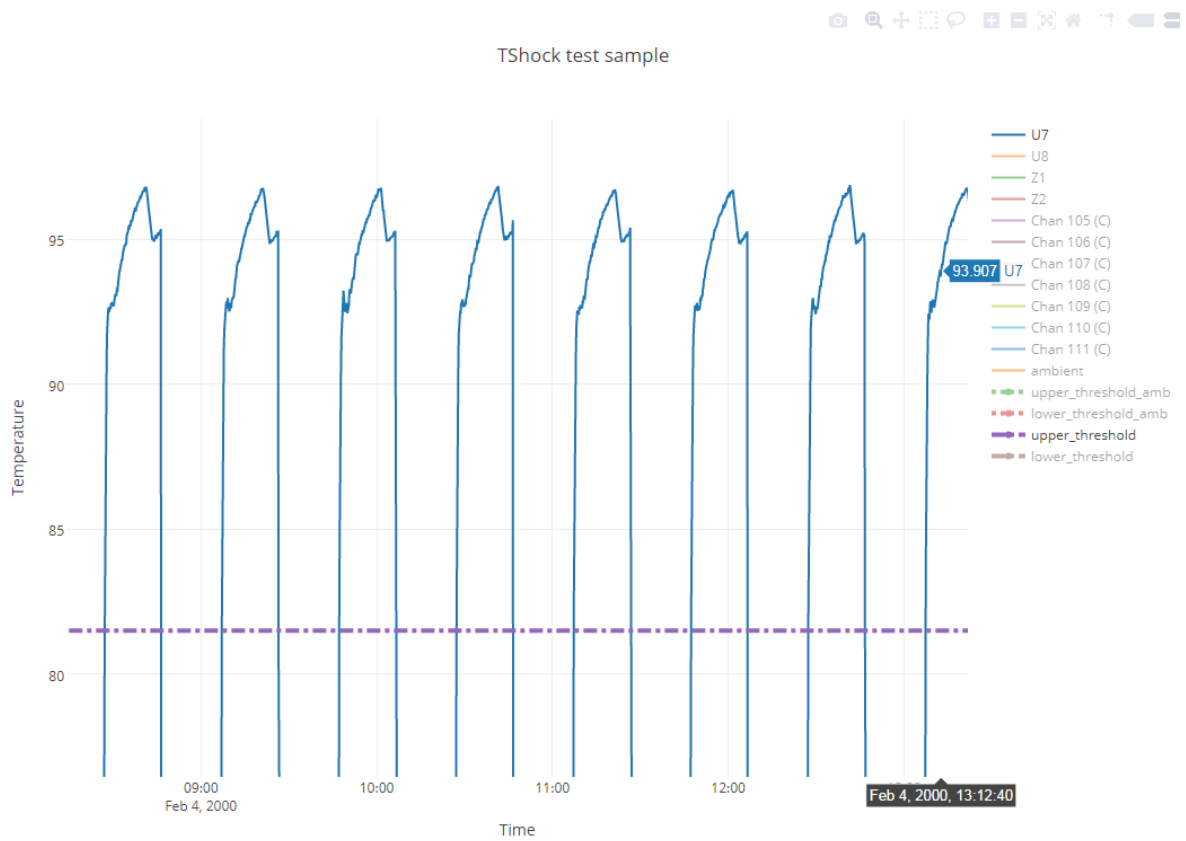
2. Analyze! (Click "Analyze!" Button)


```
C:\windows\py.exe

Upper Threshold: 95
Lower Threshold: -40
Channels: {'Chan 102 (C)': 'U8', 'Chan 105 (C)': '', 'Chan 111 (C)': '', 'Chan 1
12 (C)': 'ambient', 'Chan 109 (C)': '', 'Chan 108 (C)': '', 'Chan 101 (C)': 'U7'
, 'Chan 104 (C)': 'Z2', 'Chan 103 (C)': 'Z1', 'Chan 107 (C)': '', 'Chan 106 (C)'
: '', 'Chan 110 (C)': ''}
Amb Channel: 112
C:\Users\s.chen6\AppData\Local\Programs\Python\Python35\lib\site-packages\plotly
\api\v1\clientresp.py:40: UserWarning:

Estimated Draw Time Too Long

The draw time for this plot will be slow for all clients.
inside tshock_analyze_all_channels...
inside ambient_analysis...
STARTING POINT: HIGH SOAK
Chan 101 (C)
STARTING POINT: HIGH SOAK
Chan 102 (C)
STARTING POINT: HIGH SOAK
Chan 103 (C)
STARTING POINT: HIGH SOAK
Chan 104 (C)
STARTING POINT: HIGH SOAK
Chan 105 (C)
STARTING POINT: TRANSFORM UP
Chan 106 (C)
STARTING POINT: HIGH SOAK
Chan 107 (C)
STARTING POINT: HIGH SOAK
Chan 108 (C)
STARTING POINT: HIGH SOAK
Chan 109 (C)
STARTING POINT: HIGH SOAK
Chan 110 (C)
STARTING POINT: HIGH SOAK
Chan 111 (C)
STARTING POINT: HIGH SOAK
Chan 112 (C)

ANALYSIS COMPLETE.
```

- In this interface, the notification can show the progress of analysis, and also can show how the channel start.

3. Plotting

TShock test sample
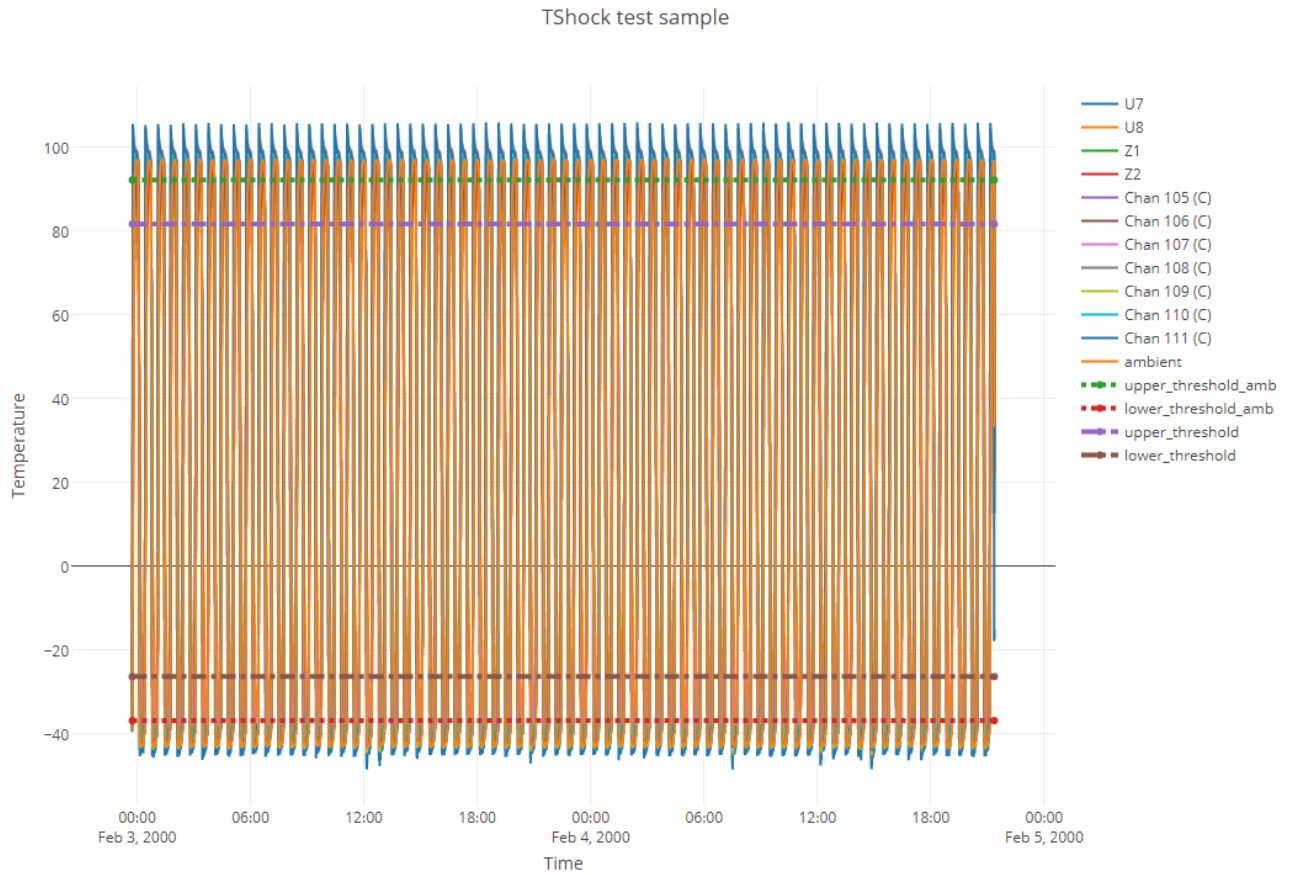
- This is the general plot of raw testdata.
- The X axis is the time scale and index.
- The Y axis is the temperature(C) over that scan.
- This graph can show only selected channels, and also can zoom in and out.

TShock test sample

U7
U8
Z1
Z2
Chan 105 (C)
Chan 106 (C)
Chan 107 (C)
Chan 108 (C)
Chan 109 (C)
Chan 110 (C)
Chan 111 (C)
ambient
upper_threshold_amb
lower_threshold_amb
upper_threshold
lower_threshold

93.907 U7

Feb 4, 2000, 13:12:40

09:00   10:00   11:00   12:00
Feb 4, 2000

Time

TShock test sample

U7
U8
Z1
Z2
Chan 105 (C)
Chan 106 (C)
Chan 107 (C)
Chan 108 (C)
Chan 109 (C)
Chan 110 (C)
Chan 111 (C)
ambient
upper_threshold_amb
lower_threshold_amb
upper_threshold
lower_threshold

78.848 ambient

09:    Feb 4, 2000, 09:26:40   10:00   11:00   12:00   13:00
Feb 4, 2000

Time

4. Output Excel

	A	B	C	D	E	F	
1	Version 4.0						
2							
3	In this TSHOCK test file, there are 68 cycles.						
4							
5	The First Table: List out the test data that have reading error.						
6		Sweep #	Time	Chan 112 (C)			
7							
8							
9							
10	The Second Table: Summary table for the ambient.						
11							
12							
13							
14							
15		cold_soak_duration_minute	cold_soak_mean_temp_c	cold_soak_max_temp_c	cold_soak_min_temp_c	hot_soak_duration_minute	hot_soa
16	mean	16.3	-41.74	-37.46	-43.17	13.72	
17	min	16.17	-41.84	-37.91	-43.6	13.5	
18	min_cycle#	5	45	65	59	11	
19	max	16.5	-41.63	-37.07	-42.89	13.83	
20	max_cycle#	62	39	1	63	42	
21	std_dev	0.1	0.05	0.23	0.14	0.08	
22							
23							
24							
25	The Third Table: List out the calculation result for each cycle of ambient.						
26							
27							
28							
29							
30	cycle#	cold_soak_duration_minute	cold_soak_mean_temp_c	cold_soak_max_temp_c	cold_soak_min_temp_c	hot_soak_duration_minute	hot_soa
31	1	16.33	-41.79	-37.07	-43.17	13.67	
32	2	16.33	-41.76	-37.32	-43.32	13.67	
33	3	16.33	-41.77	-37.39	-43.16	13.67	
34	4	16.33	-41.8	-37.53	-43.36	13.67	
35	5	16.17	-41.78	-37.77	-43.11	13.67	
36	6	16.33	-41.7	-37.3	-43.15	13.67	

- Each tab of the output excel represent one channel.
- Each sheet is consisted with 3 tables as this instruction mentioned above.

5. Independency

- Python3
- Pandas - Data wrangling and processing
- Matplotlib - Plotting
- XlsWriter - Creates analysis tables
- PyQt5 – GUI

Authors

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