

Timing Module for NPAS

Autonomous Monitoring and Control of Rocket Test Systems Internship

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Daniel Guo

Texas A&M University

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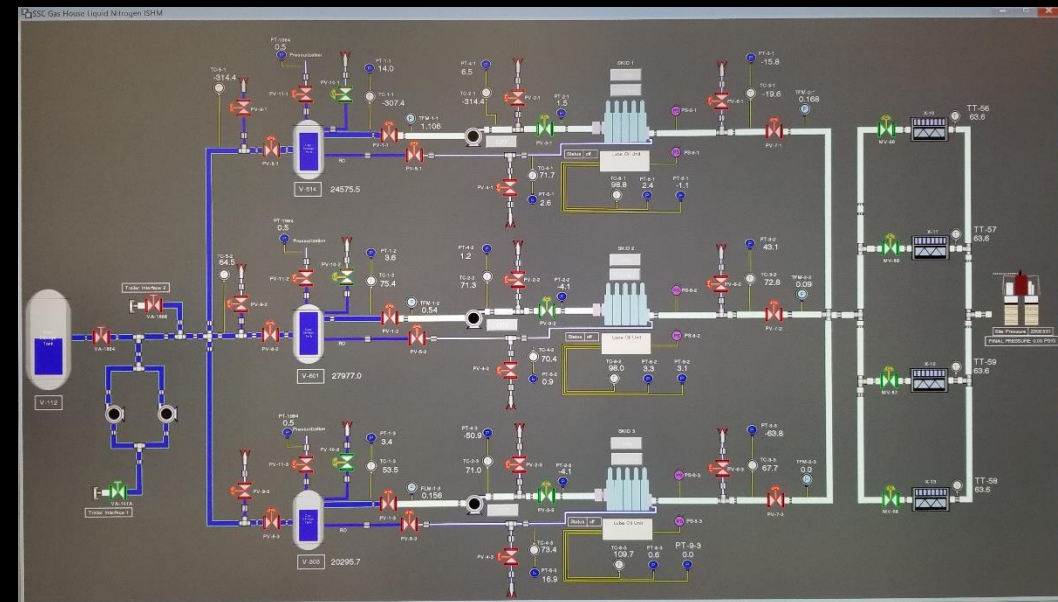
Mentor: Dr. Fernando Figueroa

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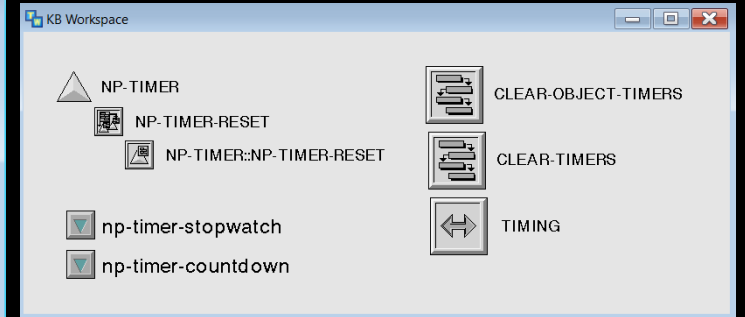
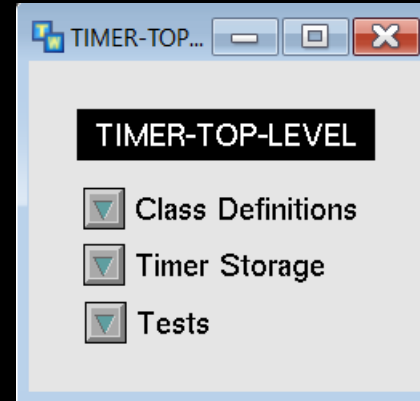
Background

- High Pressure Gas Facility
 - INSIGHT
 - Gensym G2
 - D2K
- Timing Module
- 3 potential uses
 - Usage Timing
 - Sequence Step Timing
 - Valve Cycle Timing



Overview

- Modular and generic
 - Not application specific
 - Can be used in any G2 or NPAS application
- Code is easy to read and is properly commented
 - Enables others to understand and evolve the code without spending much time in deciphering the code



```
create-stopwatch (object: class object, attribute: symbol, setting-on: sequence)  
{  
*****  
Procedure Name: create-stopwatch  
  
Description: This method creates an np-timer-stopwatch object and places it on a timer-storage workspace. This stopwatch will track changes to the attribute specified in the input, and will treat the setting-on input as the value of the attribute that will be treated as an on cycle.  
  
Inputs: OBJECT is the object that will be used  
        ATTRIBUTE is the attribute of the object that will be tracked by the created stopwatch  
        SETTING-ON is the value of the attribute that will be treated as an on cycle  
  
Returns:  
  
*****  
}
```

Stopwatch (State-timer)

- Tracks attribute value (e.g. when a pump is on or off)
 - Define values for an on cycle
 - Timer will tell you how long the attribute had those values
- Can optionally store history
 - Stores start and stop times of each cycle
 - Can later perform analysis on history
 - Runtime
 - Duty Cycle `#32 1:51:45 p.m. duty cycle is 80.832%`

The screenshot displays a software interface with several windows. The main window, titled "POSITION-OF-TEST-1-STOPWATCH-1, a np-timer-stopwatch", shows configuration details for a stopwatch. The "On time" field is highlighted with a red box, and the "Off time" field is highlighted with a blue box. Below this, a smaller window titled "TEST-1, a testing-object" shows the current state of the object, with the "Position" field highlighted in green. To the right, another window titled "ON-OF-TEST-1-STOPWATCH-1" displays the stopwatch's history, showing sequences of on and off states with their respective start and stop times.

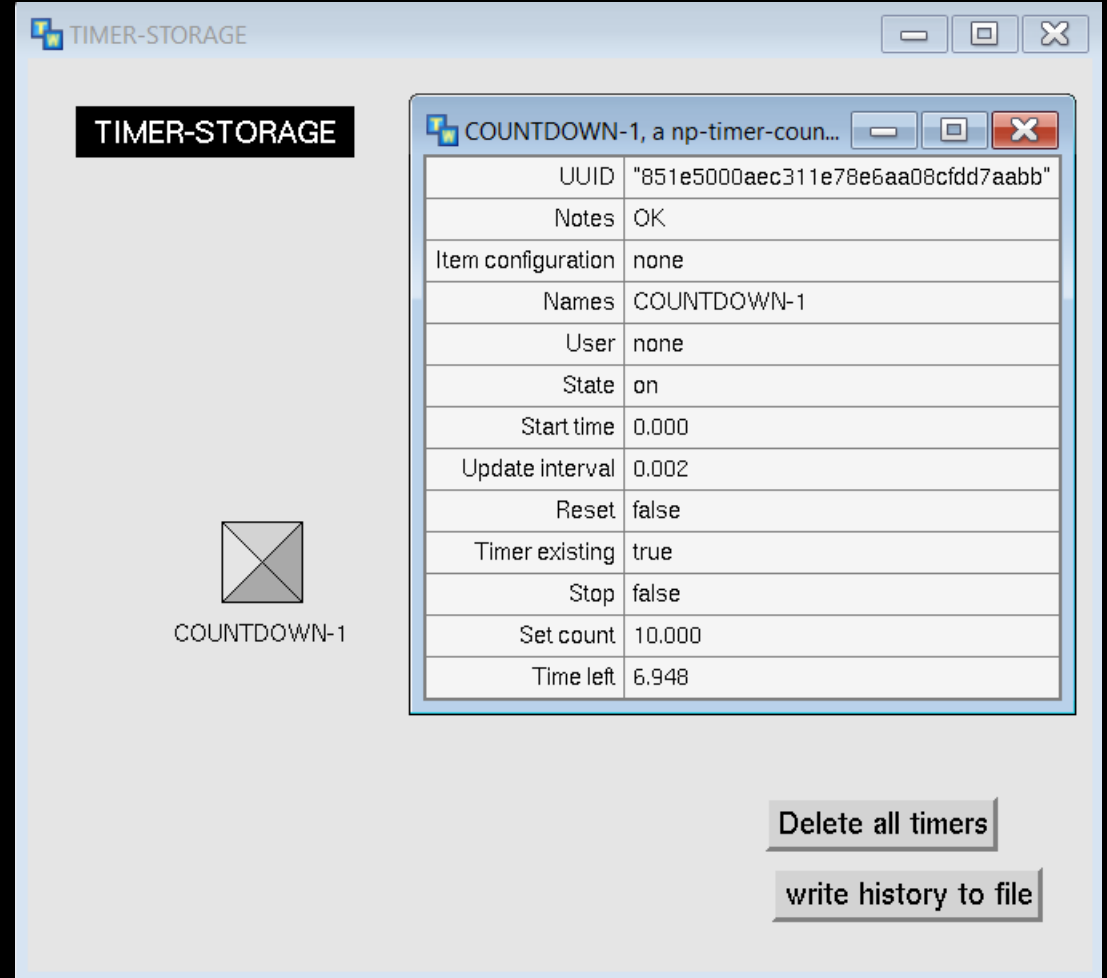
Field	Value
UUID	"3b0f7036d91511e78e6da08cfd7aabb"
Notes	OK
Item configuration	none
Names	POSITION-OF-TEST-1-STOPWATCH-1
User	test-1
State	on
Start time	69.744
Update interval	0.002
Reset	false
Timer existing	true
Tracked attribute	position
On cycle values	sequence (the symbol open, the symbol partially-open)
Current count	21.227
Counting	on
On time	40.174
Off time	5.599
Timer history	the np-timer-history POSITION-OF-TEST-1-STOPWATCH-1-HISTORY

Field	Value
UUID	"0ab1aa75c49611e78e6bcad719bf52b5"
Notes	OK
Item configuration	none
Names	TEST-1
Position	open
Light	on

Field	Value
UUID	"4f406740d91511e78e6da08cfd7aabb"
Notes	OK
Item configuration	none
Names	POSITION-OF-TEST-1-STOPWATCH-1-HISTORY
Initial counting	off
On history	sequence (structure (start-time: 23.941, stop-time: 64.133), structure (start-time: 69.725, stop-time: 0.000))
Off history	sequence (structure (start-time: 20.002, stop-time: 23.941), structure (start-time: 64.133, stop-time: 69.725))

Countdown

- Sets a countdown
 - Performs an action at time up
- Delayed procedure invocation
 - Executes a procedure after a set time
- Features
 - Reset
 - Pause
 - Stop
 - Override countdown with new time

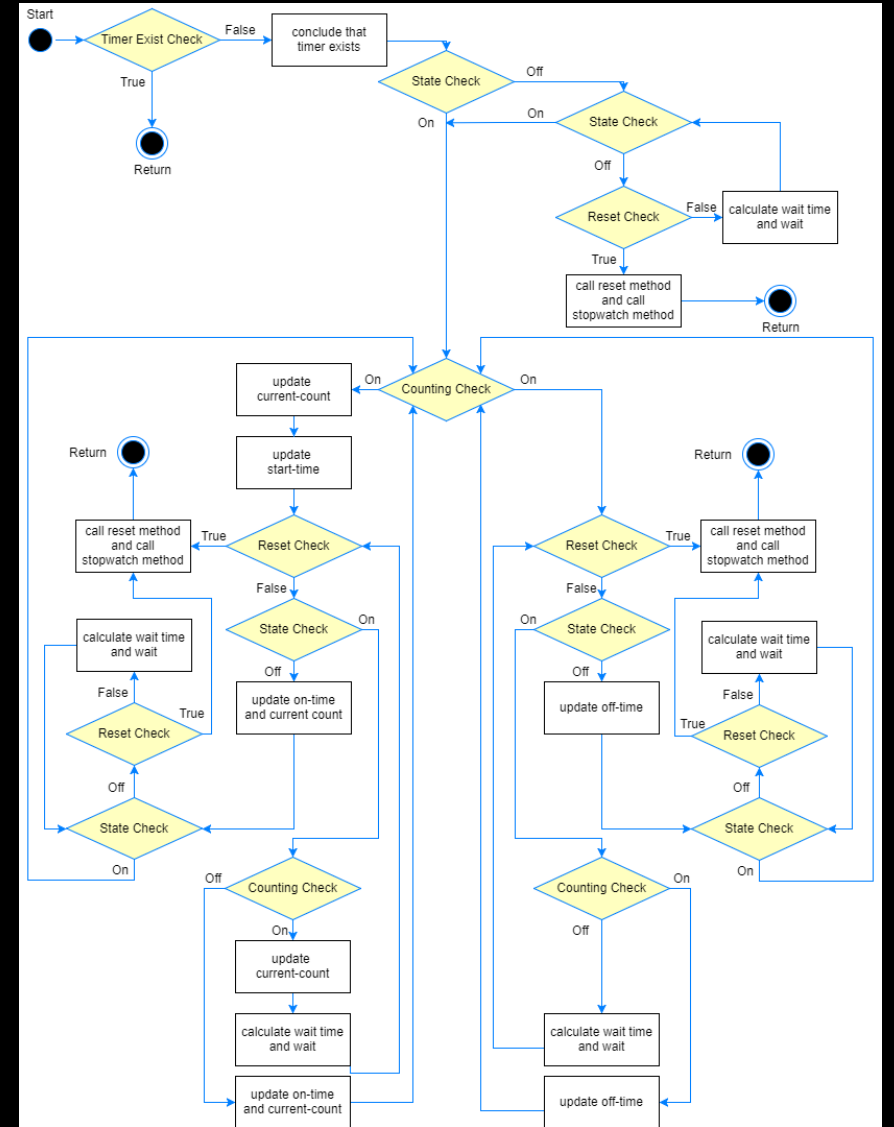


The screenshot displays the 'TIMER-STORAGE' application window. A sub-window titled 'COUNTDOWN-1, a np-timer-coun...' is open, showing a table of configuration parameters for a timer. The table includes fields such as UUID, Notes, Item configuration, Names, User, State, Start time, Update interval, Reset, Timer existing, Stop, Set count, and Time left. Below the table, there is a button labeled 'COUNTDOWN-1' with a square icon containing an 'X'. At the bottom right of the application window, there are two buttons: 'Delete all timers' and 'write history to file'.

Property	Value
UUID	"851e5000aec311e78e6aa08cfd7aabb"
Notes	OK
Item configuration	none
Names	COUNTDOWN-1
User	none
State	on
Start time	0.000
Update interval	0.002
Reset	false
Timer existing	true
Stop	false
Set count	10.000
Time left	6.948

Documentation

- User Guide
- Activity Diagrams
- Commented Code
- Possible Future Improvements



Growth

- Learned a new language (G2) and gained experience in object-oriented programming
- Improved ability in working independently
- Observed integration of NPAS implementation for a space habitat module at JSC iPAS
- Firsthand experience of Stennis site

Questions?

