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How can I modify User Accessible Quantities from a button in Instruments?

There are many questions coming up at CarMaker Service regarding how to create an user-defined GUI (graphical user interface), e.g. for test automation, remote control and many other applications. In this special case, the customer wanted to add his own button to the Instruments panel and overwrite the value of an User Accessible Quantity by pressing this button

First it is important to know, that all IPG CarMaker GUIs are based on the script language Tcl/Tk. For this purpose a Tcl/Tk-interpreter is built in the CarMaker main-GUI, which is needed to run all the additional GUI easily. This mechanism also allows to create and include user-defined GUIs straightforward.

But the outmost simplest way to design a new GUI is to use the IPG Instruments panel as template and extend it. The open source code/script of the Instruments panel is located in the IPG installation directory and in the bin-folder of the corresponding CarMaker version e.g. C:\IPG\hilwin32-6.0.1\bin\Instruments.tcl Just put a copy of this script into the bin folder of your CarMaker project directory. If you are likely to change the file name, please observe that "Instruments" as identification must remain at the beginning. Herein all necessary APO communications procedures are already included and ready for action. Also different types of buttons (LEDs) and indicators are already provided. New instruments may be added just be copy and paste. A compilation or any other activities are not needed. Every change in the modified Instruments GUI will be updated with a new invocation from the CarMaker main GUI.

Now let's try out a simple example which demonstrates how to insert a new button, bind it to a new UAQ (User Accessible Quantity) and finally use this button to change the value of the UAQ during a TestRun simulation.

To get familiar with how to build GUIs with Tcl/Tk, I recommend you to have a look at the official Tcl/Tk manual page <https://www.tcl.tk/man/tcl/> where you can find a list of all Tcl/Tk commands and a tutorial (<https://www.tcl.tk/man/tcl8.5/tutorial/tcltutorial.html>).

Step1

Copy the Instruments.tcl-file to the bin-folder of your CarMaker project directory. Rename the file to Instruments_ext.tcl and open it in an appropriate Editor. Add following code to the script:

```
30 # set var = quantity accurate quantities
31 set Subscription {
32     {Qu(MyVar1) > > MyUAQ1}
33     {Qu(MyVar2) >> > MyUAQ2}
34     {Qu(MyVar3) > > MyUAQ3}
35     {Qu(MyVar4) >> > MyUAQ4}
36     {Qu(Distance) > > Veh1.Distance }
```

Add new UAQ to the subscription list

```

502  ## Control Lights
503  global LED LEDs
504  set cv .lights
505  canvas $cv -width 180 -height 170 -relief raised -bd 1
506  foreach {i txt co} $LEDs {
507    set LED($i,0) grey70
508    set LED($i,1) $co
509    set LED($i,txt) $txt
510  }
511  for {set i 0} {$i<12} {incr i} {
512    if {[info exists LED($i,0)]} {
513      set LED($i,0) grey70
514      set LED($i,1) red
515      set LED($i,txt) ""
516    }
517    set x [expr {15 + $i%3 * 47}]
518    set y [expr {9 + $i/3 * 40}]
519    frame $cv $x $y -relief sunken -bd 1
82  # max 8 Lights
83  set LEDs {
84    0 "PWR" red
85    1 "START" #0C0
86    2 "ABS" blue
87    3 "ESP" orange
88    4 "ACC" #0C0
89    5 "Obs" red
90    6 "SPD\n-" #0C0
91    7 "SPD\n+" #0C0
92    8 "UAQ1" #0C0
93    9 "UAQ2" #0C0
94    10 "UAQ3" #0C0
95    11 "UAQ4" #0C0
96  }
97
98

```

Set four new LEDs and adapt the size settings of the new LED dialog

```

545  bind $cv.l8.l <ButtonPress> { SendDVAwr MyUAQ1 1; %W configure -relief sunken }
546  bind $cv.l9.l <ButtonPress> { SendDVAwr MyUAQ2 2; %W configure -relief sunken }
547  bind $cv.l10.l <ButtonPress> { SendDVAwr MyUAQ3 3; %W configure -relief sunken }
548  bind $cv.l11.l <ButtonPress> { SendDVAwr MyUAQ4 4; %W configure -relief sunken }
549

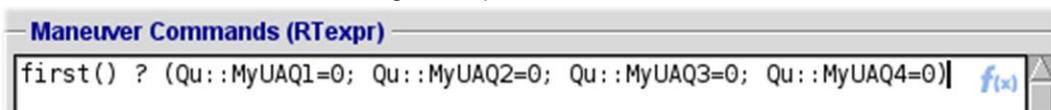
```

Bind the new LEDs as Buttons to the SendDVAwr command (which is a discrete procedure in this script!)

Do not forget to save the modified script.

Step 2

Now please start the CarMaker Main GUI and open an arbitrary TestRun from the examples (e.g. Braking). Open the Maneuver Dialog and add following RTExpressions commands in the "Maneuver Commands" of the "Global Settings / Preparation" tab to create new UAQ:

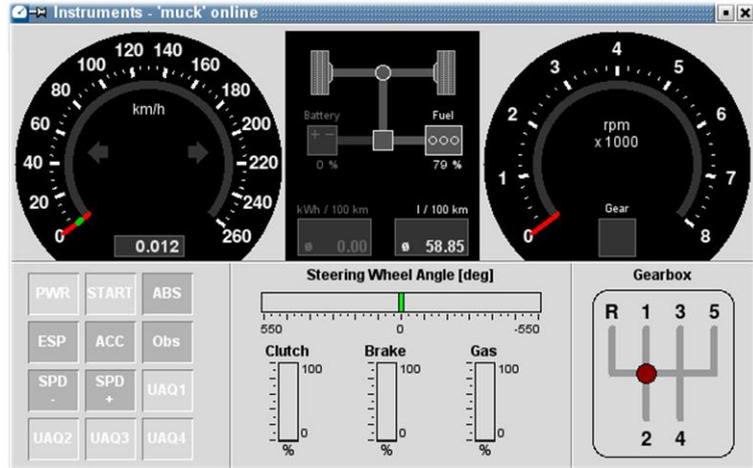
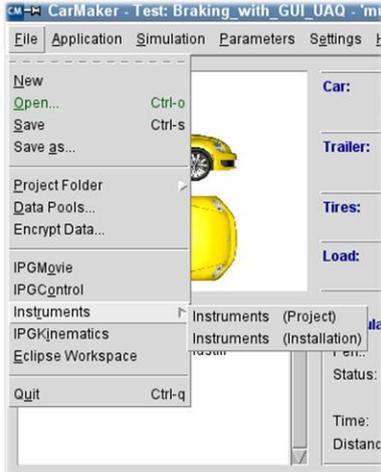


Add maneuver commands for UAQ creation

Please save the modified TestRun in your CarMaker project and finally start the simulation. Afterwards the new UAQ can also be found in the DVA (Direct Variable Access)-Dialog.

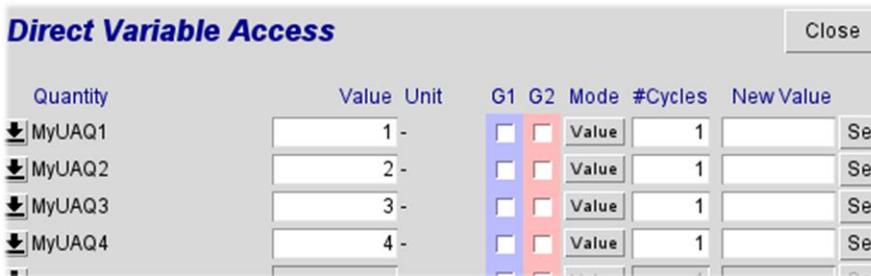
Step 3

The modified Instruments GUI may be opened from the main-GUI → File → Instruments and should look like in the figure below:



Instruments GUI selection and modified Instruments

As you can see now, there are four additional LEDs/buttons in the left corner below, which can be switched. After pushing the LEDs, the corresponding UAQ gets a new value, which was set constant in the Instruments script-file. You can check the values of these UAQ e.g. in the DVA dialog:



DVA dialog to verify the change of the new UAQs values

Instead of using a constant value, the corresponding local script variable subscribed at the beginning “Qu(...)” can be used for this purpose!