

Date: 2017-08-07

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Release No.: CarMaker 6.x

# How to define the traffic object position by using a real measurements in the form of GPS coordinates

Today I want to share an example about how to define the position of a traffic-object with GPS coordinates. It was built for a request from a customer who wanted to use a real GPS measurement for developing an ADAS system. But the corresponding UAQs, the global position (GPS) of the traffic object, cannot be overwritten by DVA command. Therefore it is necessary to convert the GPS measurement in the global position of the traffic object in the frame Fr0, which can be manipulated via DVA in the mode "Free Motion". CarMaker offers the possibility to import a measurement data with the functionality "Input from File" (IFF).

## Step 1:

Open the infofile "SimParameters" under the project folder "<project>/Data/Config" and enter the following command in it:

1: GCS.Traffic.Active=1

This optional parameter is used to activate the calculation of GPS coordinates for traffic objects.

## Step 2:

Add a .CarMaker.tcl file including the following Tcl-code at the top level of the project folder or extend an already existing .CarMaker.tcl file with these codes:

1:	SimInput::AddQuInfo {								
2:	Userl	"PoT GCS.Lat"	"PoT GCS.Lat"	"rad"					
3:	User2	"PoT GCS.Long"	"PoT GCS.Long"	"rad"					
4:	User3	"PoT GCS.Elev"	"PoT GCS.Elev"	"m"					
5:	}								
6:	SimInput::New								
7:	SetSavedData TestRun								

It is used to extend the CarMaker GUI with additional channel names and just for the visualization inside the GUI as shown in the figure below.





🛯 CarMaker - Input from	n File						_ ×	
Input from File							Close	
		Input File						
ни-		File S	heer_GPS.txt				Select	
Mode		File Type A	sciiData	<ul> <li>active</li> </ul>			Content	
	neis	Time Channel (refe	rence quantity)	- Starting C	Starting Conditions			
A land		Channel in File T	ïme 🚽	Ī	Gear No		1	
U Tort	<b>-</b>	Factor	1.0		Velocity	[km/h]	0.0	
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		End Time [s]						
			<b>5</b> 10			Circuit I		
Model Quantity to override		Channel in File	Filter	Eactor	Offect	Signal L min	mits	
Speed - Target	[m/s]			10	0.0			
Speed - Upper Limit	[m/s]			1.0	0.0			
Speed - Lower Limit	[m/s]			1.0	0.0			
Steering Wheel Angle	[rad]	-		1.0	0.0			
Steering Torque	[Nm]			1.0	0.0			
🗖 Gas Pedal	[01]			1.0	0.0			
🔲 Brake Pedal	[01]	-		1.0	0.0			
Clutch Pedal	[01]	<b></b>		1.0	0.0			
🗖 Gear No	[-1n]	-		1.0	0.0			
Selector Control	[-91]	-		1.0	0.0			
Parking Brake	[01]	-		1.0	0.0			
Brake Pressure	[bar]			1.0	0.0			
✓ PoT_GCS.Lat	[rad]	Traffic.Sheer.GCS.La		1.0	0.0			
✓ PoT_GCS.Long	[rad]	Traffic.Sheer.GCS.Lc		1.0	0.0			
PoT_GCS.Elev	[m]	Traffic.Sheer.GCS.El 🚽		1.0	0.0			
(user defined 4)				1.0	0.0			

## Step 3:

Open the User.c file in the src folder of your project directory "<project>/src".

Add the following inclusion and declaration to create three C-Code variables at the beginning of the User.c file:

1:	#define GPS
2:	#if defined (GPS)
3:	<pre>#include <gcs.h></gcs.h></pre>
4:	<pre>#include <traffic.h></traffic.h></pre>
5:	tGCSPos PoT GCS;
6:	#endif

The struct tGCSPos is defined in the header file GCS.h under the installation folder ".../ipg/hil/<version>/include/GCS.h".

In the function User\_DeclQuants (void), add the following lines to create three new UAQs:

7: # if defined (GPS)
8: DDefDouble4 (NULL, "MyGPS.Lat", "rad", &PoT GCS.Lat, DVA None);
9: DDefDouble4 (NULL, "MyGPS.Long", "rad", &PoT GCS.Long, DVA None);
10: DDefDouble4 (NULL, "MyGPS.Elev", "m", &PoT GCS.Elev, DVA None);
11: #endif



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In the function User\_In (const unsigned CycleNo), add the following lines:

12:	#if def	fined (GPS)	
13:	if	(ExtInp File Enabled) {	
14:		if (ExtInp IF.Userl.Enabled)	
15:		<pre>PoT GCS.Lat = ExtInp IF.User1.Value;</pre>	
16:		if (ExtInp IF.User2.Enabled);	
17:		PoT GCS.Long = ExtInp IF.User2.Value;	
18:		if (ExtInp IF.User3.Enabled);	
19:		<pre>PoT GCS.Elev = ExtInp IF.User3.Value;</pre>	
20:	}		
21:	#endif		

The C-Code signals for the input channels are ExtInp\_IF.User1.Value, ExtInp\_IF.User2.Value,... and so on. In this example they are mapped to the user defined quantities "PoT\_GCS.XXX".

In the function User\_Traffic\_Calc (double dt), add the following lines:

```
22: #if defined (GPS)
23: GCS ConvGCStoFr0 (&PoT GCS, Traffic GetByTrfId(0)->t 0);
24: #endif
```

The GPS coordinates "PoT\_GCS.XXX" will be translated to the cartesian coordinates of the first trafficobject in Fr0 with the function "GCS\_ConvGCStoFr0" which is defined in the header file GCS.h.

#### Step 4:

Generate a new CarMaker application and choose it after opening the Configuration/Status tab from the CarMaker main GUI.

#### Step 5:

Import the GPS measurement through the dialog "Input from File"(GUI:Parameters) and assign them to the corresponding channels. A corresponding simple TestRun is available in the download package.

In this example the first traffic object "Sheer" with the mode "Free Motion" will move according to the GPS measurement data "Sheer\_GPS.txt":

C	4 (	CarMaker	- Traffi	C							_ × _
	Tra	affic	Movie G	eometry		Description		Dimension Lx w x	3D	Preview	Close
	0 1 2 3 4 5 6 7	Sheer Ahead Beac0 Beac1 Beac2 Beac3 Beac4 Beac5	Toyota_ MB_MC RoadBe RoadBe RoadBe RoadBe RoadBe RoadBe	Camry_2006. lass_1998.md accon_Road.n accon_Road.n accon_Road.n accon_Road.n accon_Road.n	nobj bj nobj nobj nobj nobj nobj	Vehicle 1, right Vehicle 2, righ RoadBeacon 1 RoadBeacon 2 RoadBeacon 3 RoadBeacon 4 RoadBeacon 4	t lane, color: red t lane, color: blue 1 2 3 4 5	$\begin{array}{c} 4.8 \times 1.8 \times 1.2 \\ a \ 4.1 \times 1.7 \times 1.2 \\ 4.1 \times 1.7 \times 1.2 \end{array}$	20 40 10.0 30.0 50.0 70.0 90.0 110.0	-2 -2 0.5 0.5 0.5 0.5 1.5 2.5	New Copy Paste Delete Import
- Traffic Object Sheer											
General Parameters Motion Model Maneuver Autonomous Driving Channel in File											
	С	Maneuver	• Fre	e Motion		Update rate	200 📥 Hz				
	Sta	irt	Lon	g	Long Sup	Lat	Lat St	up Hid	lden		
	==	≔ Global S	ettings /	Start Conditio	1S ===					New	