*

. .

.

.   –   –   .

.

.   .

.

.

.

:

_____

*

1- :

.

.

1.2- :

.[2]

—   —

.

.

1.1- :

.

1.3 :

.

.

2. **محاكيات القيادة** *Driving Simulators*

.

.

.

.

.

.

.

.

.

180   .

.

.

‒

‒

.

.

.

.

.1.2   **(Fixed Base**

:Driving Simulators)

(   )

(   )   .[6]

(   )

[5]

15

.[1 3]   .[7]

                                                                                    .

.   .

                                                                                    .

                                                                  ^{2} 25

                                                         .

.

                    −   .[8]

                                −   **(Motion**   **2.2.**

        .   **:Base Driving Simulators)**

                    .   .

                                              3.

                                        :

                                                                        .

                    .   .

                                                                  .

        .

                                                                        .

                (1)   .   .

            .   250

                                                            45

.
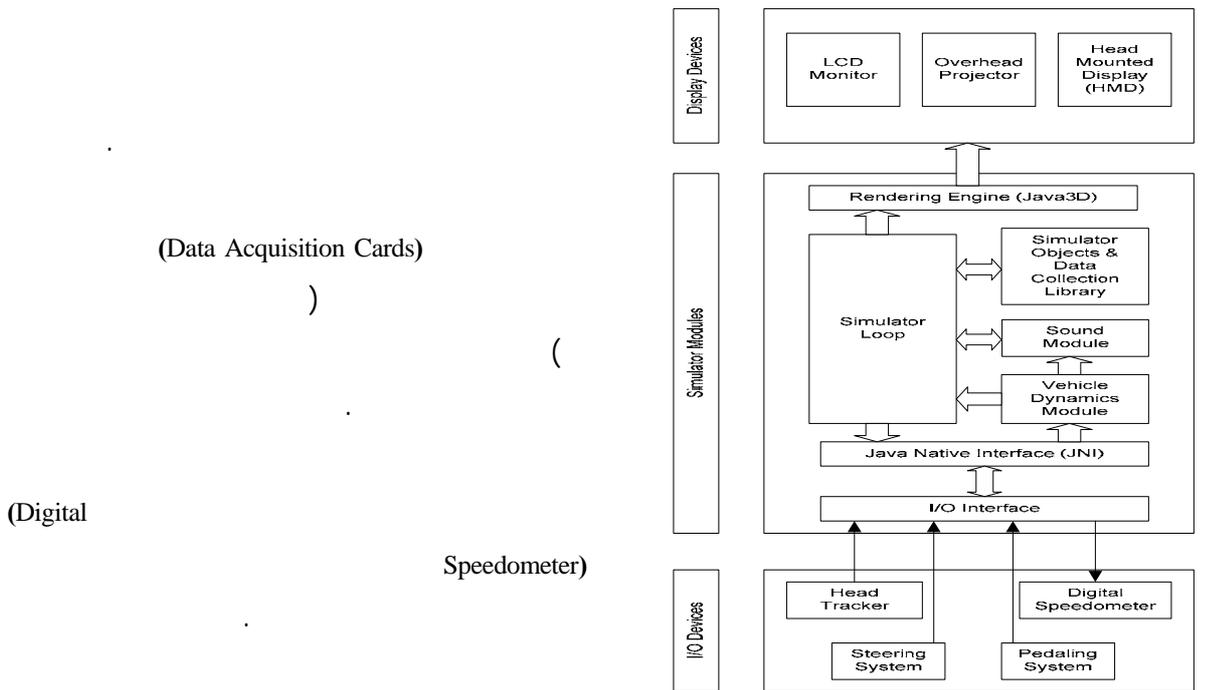
(Data Acquisition Cards)

)

(

.

(Digital

Speedometer)

.

.

.

.

( )

.

.

(Head-

mounted Display)

( )

Display Devices

| LCD Monitor | Overhead Projector | Head Mounted Display (HMD) |

Simulator Modules

Rendering Engine (Java3D)

Simulator Loop

| Simulator Objects & Data Collection Library |
| Sound Module |
| Vehicle Dynamics Module |

Java Native Interface (JNI)

I/O Interface

I/O Devices

| Head Tracker | Digital Speedometer |
| Steering System | Pedaling System |

1

(Steering   **(Pedaling System)**

(Head Tracking   **System)**

.System)

.

"

.(3D Engine) "

:   **.1.3**

.

.

．

．

． ．

．

．

． ．

．

．

.2.3

．

．

6　　　　　　　.(Head　tracker)
．　　　3　　　　3

．

．　　　　．

(2)

．

．

．
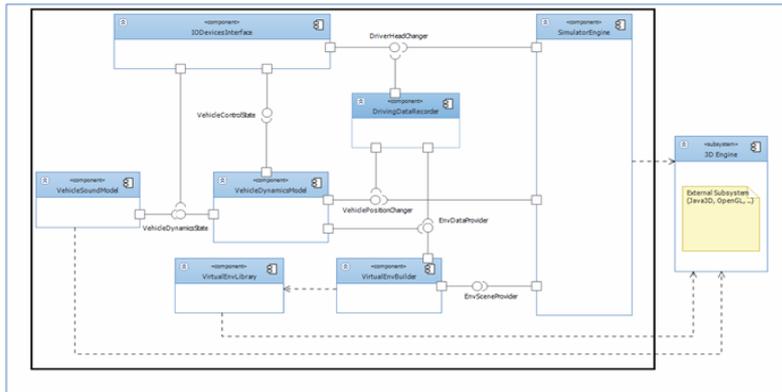
2

(provided

(required   interfaces)

.interfaces)

.1.2.3   (   )

:IODevicesInterface Component

)

(

(Required Interface)   (Provided Interface)

.(3)   (   )

.1.4

( ) IO Devices Interface **3**

getVehicleVelocity()
getVehicleGear()

VehicleDynamicState

«component»
IODevicesInterface

VehicleControlState

getGasPedalValue()
getBrakePedalValue()
getSteeringWheelAngle()

DriverHeadChanger
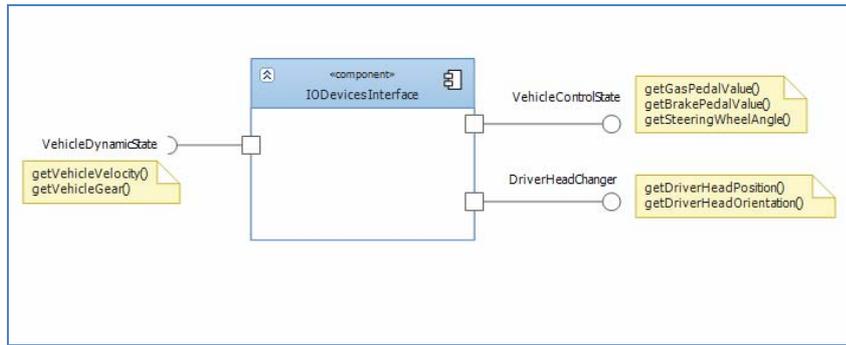
getDriverHeadPosition()
getDriverHeadOrientation()

) Vehicle Control State

(

) IO Device Interfae

(

:

• Get Gas Pedal Value:

.

• get Brake Pedal Value:

.

• Get Steering WheelAngle:

.

) Driver Head Changer

(

) IODeviceInterfae

(

:

• Get Driver Head Position:

(x,y,z)

• Get Driver Head Orientation:

.(x,y,z)

) Vehicle Dynamic State

(

) IO Device Interfae

(

get Vehicle)

(get Vehicle Gear   Velocity

.

.   2.2.4

Java

Java

.

java native interface (JNI)

(Java)

C++   C   .

(Dynamic Link

.   Libraries)

native methods

20

） Env Data Provider

Java （　　　　　）

（

（　　） **.2.2.3**

VehicleDynamicsModel Component

．

．

．

） Vehicle Control State

（

．

．

．

．　（　　　）

） IO Device Interface

Vehicle Control （

（　　　　　　） State

（　　　　　） Virtual Env Builder

） Env Data Provider

．（

Vehicle Control State

（　　　　　　）

(4)　　　　　．

．

．（　　　）

getGasPedalValue()
getBrakePedalValue()
getSteeringWheelAngle()

VehicleControlState

«component»
VehicleDynamicsModel

VehiclePositionChanger

getVehicleDisplacement()
getVehicleTurnAngle()

getEnvInfo()

EnvDataProvider

VehicleDynamicState

getVehicleVelocity()
getVehicleGear()

4 مدل دینامیک خودرو (Vehicle Dynamics Model)

Vehicle Position Changer (_____

:(_____

) Vehicle Dynamics Model

(

• Get Vehicle Gear:
_____ .

Vehicle Control State (_____

:(_____

IO Devices Interface

(_____) .

4.2.1. _____ Vehicle

Dynamics Model (_____)

_____ .

Env Data Provider (_____

:(_____

) Vehicle Dynamics Model

(

(.._____)

_____ .

4.2.6

_____ .

_____ :

• Get Vehicle Velocity:
_____ .

:

• Get Vehicle Displacement:
_____ .

• Get Vehicle TurnAngle:
_____ .

Vehicle Dynamic State (_____

:(_____

) Vehicle Dynamics Model

(

_____ :

22

.3.2.3   **(   )**   Vehicle

:Sound Model Component

.   [4]

.   (5)

.

) Vehicle Dynamic State   (

) Vehicle Dynamics Model

.2.2.4   (   )

.(
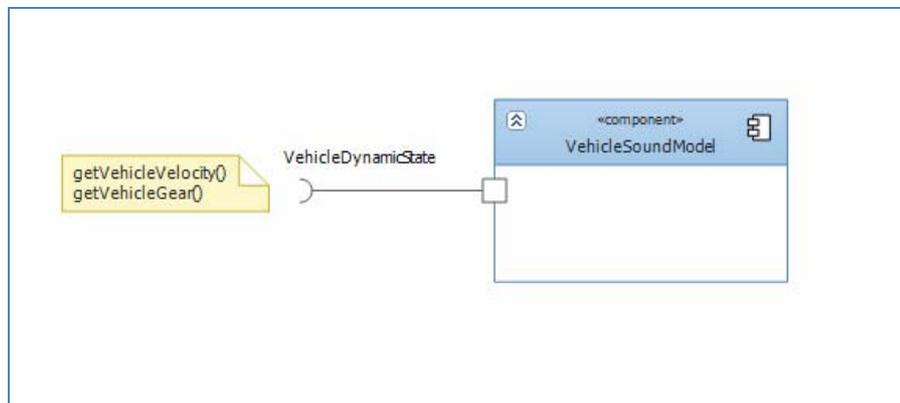
getVehicleVelocity()
getVehicleGear()
VehicleDynamicState
«component»
VehicleSoundModel

.5   ) Vehicle Sound Model   (

.4.2.3   **(   )**   Simu lator

:Engine Component

.

(infinite loop)   **:(6)**

) Driver Head Changer

.   **:(**

(simulator cycle)   IODevices Interface

(   )

(number of frames   **.1.2.4**

per second)

.

OpenGL   Java3D

.

(view object)

.

) Env Scene Provider ( ) Vehicle Position Changer (

:(:(

Vehicle Dynamics

. ( ) Model

6.2.4 .2.2.4

.

.
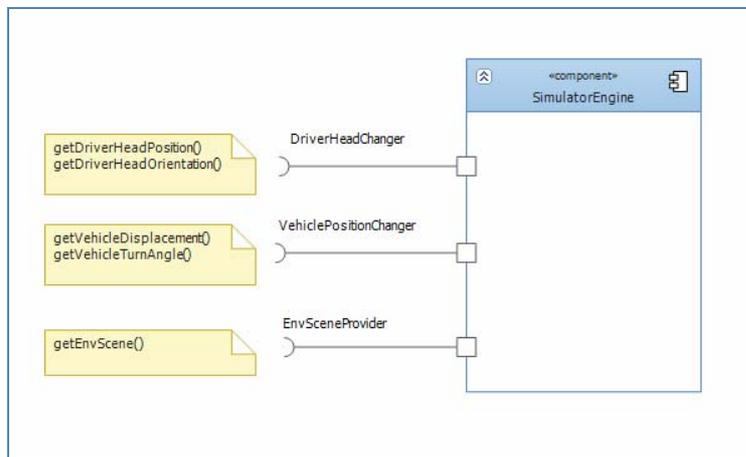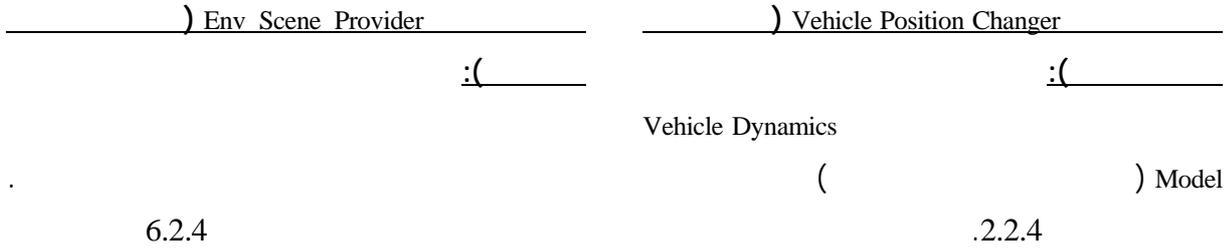
( ) **Simulator Engine** 6

: .2

(view object)

: .3 .

.

: .4 .

5.2.3 ( ) :Virtual Env

:Library Component

.

.

.

: .5

:

. : .1

.

OpenGL Java3D

Virtual Env

.( ) Library   .

6.2.3 ( )   **Virtual**

Env Builder Component: OpenGL   Java3D

.

.(7)
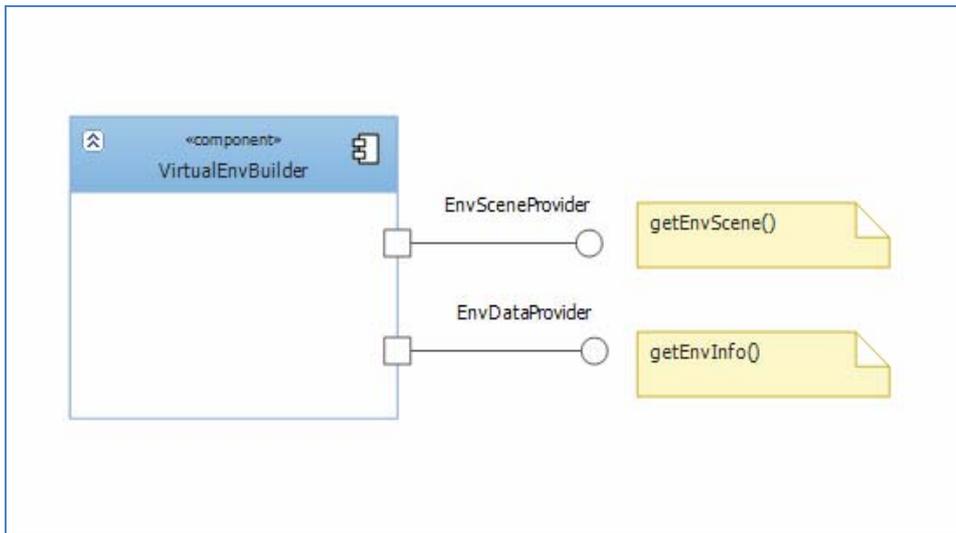
7   Virtual Env Builder ( )
_____) Env Scene Provider   _____) Env Data Provider
:(_____   :(_____

.   .

(graph)   (tree)

(root node)

:   .

• get Env Scene:

(Rendering)   .

(graph)   (tree)

(root node) ‏.3‏ ‏.

‏: ‏.4 ‏.

getEnvInfo: • ‏.5 ‏.

‏. ‏.6 ‏.

3.2.7 ‏( ) **Driving** ‏.7 ‏.

Data Recorder Component:

‏.

‏.

‏: ‏.(8)

‏.1 ‏.

‏.2 ‏.
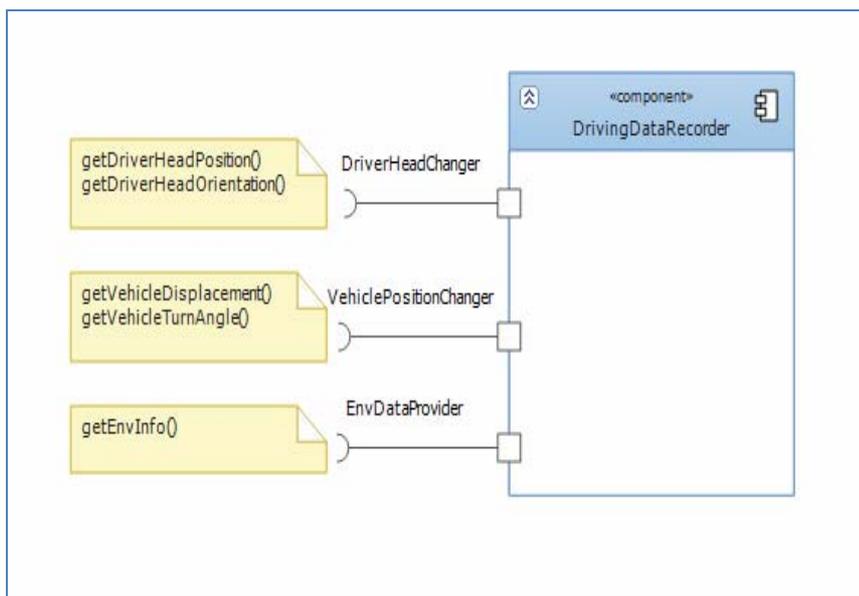
8 Driving Data Recorder ‏( )

4. ‏.

‏.

‏.

‏.

.

.

.

(Provided Interfaces)

. (Required Interfaces)

.

.

5.

.

.

.

*

[1] Auckland, R.A., Manning, W.J., Carsten, O.M.J. and Jamson, A.H. (2008). Advanced driver assistance systems: Objective and subjective performance evaluation. Vehicle System Dynamics, 46, pp.883-897.

[2] Hein, C. M. (1993). Driving Simulators: Six Years of Hands – on Experience at Hughes Aircraft Company. In proceedings of the Human Factors and Ergonomics society 37th Annual Meeting. Santa Monica, CA, 607-611.

[3] Jamson, A.H., Lai, F.C.H. and Carsten, O.M.J. (2008). Potential Benefits of an Adaptive Forward Collision Warning System. Transportation Research Part C: Emerging Technologies 16(4), pp. 471–484.

[4] Li Xun-xiang; Zhan Duo; Cheng Dongyan; Chen Dingfang; , (2008). "Implementation of 3D sound effect modeling technology based on vehicle driving simulator," Computer-Aided Industrial Design and Conceptual Design. CAID/CD 9th International Conference, 22-25 Nov. 2008, pp.63-68.

[5] Mourant, R. R. and Zhishuai Yin. (2010). "A Turning Cabin Simulator to Reduce Simulator Sickness." Proceeding of IS&T/SPIE Electronic Imaging 2010, San Jose, CA, pp. 17-21.

[6] Mourant R. R., Tsai, F., Al-Shihabi, T., and Jaeger, B. K. (2001) Measuring the divided attention capability of young and older drivers. Transportation Research Record (Journal of the Transportation Research Board), No. 1779, 40-45.

[7] Suresh, Piriyakala and Mourant, Ronald R. (2005). "A Tile Manager for Deploying Scenarios in Virtual Driving Environments". Proceedings of the Driving Simulation Conference North America, pages 21-29.

[8] Wolffelaar, P. V., Bayarri, S., and Coma, I. (1999) Script-based definition of complex driving simulator scenarios. In: Proceedings of the Driving Simulator Conference DSC'99, Paris.

2013/7/22

28