

User manual

sig_ros package

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1 Generalities

1.1 Goal

This package aim to provide a tool for using SIGVerse[1] though ROS without knowledge of SIGVerse or limited knowledge.

Using sig_ros package will allow you to send topics and call services directly to SIGVerse.

1.2 For who?

This package is intended for ROS users or SIGVerse users who want to use SIGVerse in a different way.

For using this package you previously need basic knowledge of ROS, that means at least the beginner level of the ROS tutorials page[4], running a node, publishing and subscribing to a topic, calling a service...is the minimum requiered.

1.3 Install

First of all, you have to install SIGServer[2] and SIGViewer[3] like explained in the SIGVerse wiki page[1].

Create a catkin workspace:

```
mkdir -p ~/catkin_ws/src
```

Initialize the workspace:

```
cd ~/catkin_ws/src
catkin_init_workspace
cd ..
catkin_make
source devel/setup.bash
```

Clone the git repository:

```
git clone https://github.com/GG31/sig_ros.git
```

Change the name of sig_ros folder you've just cloned by src, so you have the tree:

```
|-- catkin_ws
   |-- src
```

```
    |-- sig_ros
    |-- user
|-- devel
|-- build
```

Change the absolute links on catkin_ws/src/user/xml/CleanUpDemo2014.xml there is 5, on catkin_ws/src/sig_ros/src/ros_controller.cpp there is one and on catkin_ws/src/sig_ros/CMakeLists.txt

Create libsig_ros:

```
mkdir ~/catkin_ws/devel/lib/libsig_ros
```

2 Usage

The repository https://github.com/GG31/sig_ros.git contains two package sig_ros and user. sig_ros is the package who make the interface between SIGVerse and ROS and user is an example of package who contains severals nodes. These nodes send messages and call services who reproduce the clean up task demo.

On the directory `~/catkin_ws/src/user/xml` there are the all xml file needed by the clean up task.

Go to the directory `~/catkin_ws/src/user/xml` and run the `ros_controller` node of the sig_ros package with:

```
cd ~/catkin_ws/src/user/xml
roslaunch sig_ros ros_controller CleanUpDemo2014Robot.xml
```

The SIGServer is launched automatically and you and see the number of the port.

Find the IP address with `ifconfig`.

Then open the SIGViewer and write the IP adress and the port. Click on “Connect”. It is the step 1 in the figure 2.1.

After that, you can see the world defined by the xml files, if the camera is not well positionned, do not hesitate to move it with the mouse and the keys Ctrl, Alt and Maj.

Start the simulation, the all topics and services are created at the same time. This is the step 2 in figure 2.1. After that, you will be able to publish, subscribe and call a service.

You can see figure 2.1 a sum up of the three steps. During the third step you can create all the node you want and communicate with SIGVerse.

For example, in the package user, there are severals node which can be started, “RobotCommand”, “ModeratorCommand”,...

Start the “RobotCommand” node.

```
roslaunch user RobotCommand
```

The robot will begin to move.

If you start the service “Referee” and the “ModeratorCommand” node, the score will be counted.

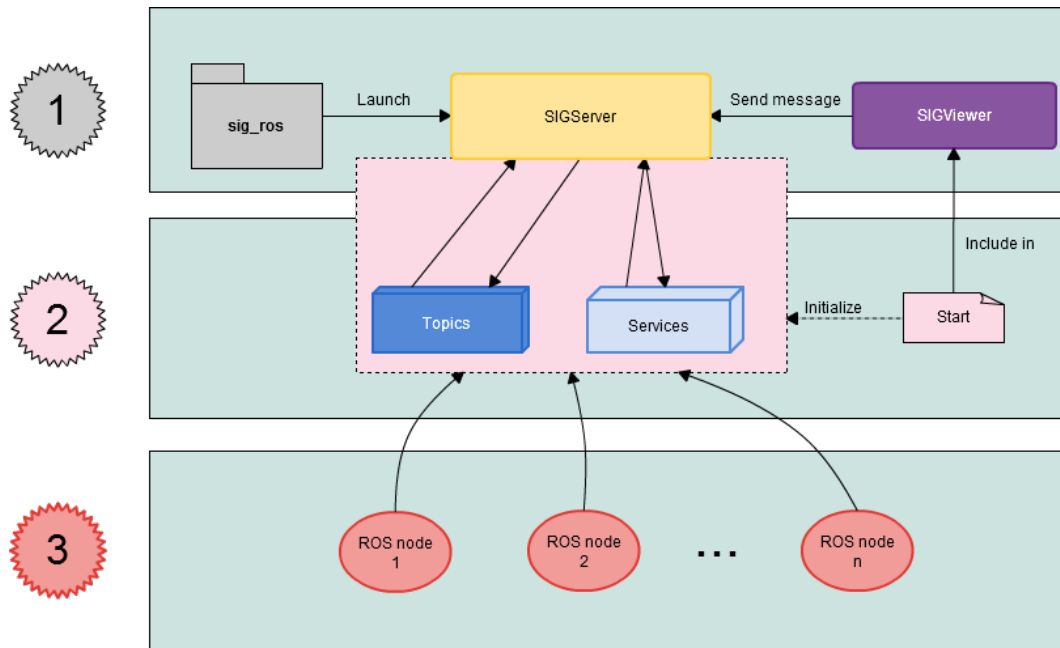


Figure 2.1: Usage of the package

3 Topics

For all the topics, if there is a parameters called “name”, that means it refers to an entity. For example, if we have the topic robot_000_setPosition if the parameter “name” is filled by “trash-box_0”, the topic will set the position to the trashbox, but if the parameter “name” is an empty string, then it will be the “robot_000”. For the services, the parameter “name” works as well.

Topic name	Type	Description
_addForce	Double3D	Add force to a body using absolute coordinates (only in Dynamics ON).
_addForceAtPos	Double3D3D	Add force to a entity using absolute coordinates at specified absolute position (only Dynamics ON).
_addForceAtRelPos	Double3D3D	Add force to a entity using absolute coordinates at specified relative position (only Dynamics ON).
_addRelForce	Double3D	Add force to a entity using relative coordinates (only Dynamics ON).
_addRelForceAtPos	Double3D3D	Add force to a entity using entity-relative coordinates at specified absolute position (only Dynamics ON).
_addRelForceAtRelPos	Double3D3D	Add force to a entity using entity-relative coordinates at specified relative position (only Dynamics ON).
_onCollisionMsg	OnCollision	The name of the agent which one is in collision with are sent to this topic. If there is several collision at the same time, several messages are sent.
_onRecvMsg	MsgRecv	The “Controller” send the message received by the SIGViewer.
_releaseObj	ReleaseObj	Publish the part which you want to release an object and it will be done.
_setAccel	Double3D	Set the acceleration to the entity
_setAngularVelocity	Double3D	Set angular velocity to the entity name (only in Dynamics ON)
_setAxisAndAngle	SetAxisAndAngle	Set the axis defined by “axisX”, “axisY” and “axisZ” and set the angle “angle” to the entity called “name”, if no name is provided, the main entity of the topic will be set.

_setCollisionEnable	SetCollisionEnable	Set if the collision is enable, true, false otherwise.
_setDynamicsMode	SetMode	Enable (true) or disable (false) gravity mode.
_setForce	Double3D	Set the force applied to the entity (only in Dynamics ON).
_setGravityMode	SetMode	Set the gravity mode, true if enable, false otherwise.
_setJointAngle	SetJointAngle	Set the angle of the joint (only in Dynamics OFF).
_setJointQuaternion	SetJointQuaternion	Set the quaternion of joint (only in Dynamics OFF).
_setJointVelocity	SetJointVelocity	jointName, angular velocity, max ???
_setMass	SetMass	Set the mass of the entity .
_setOwner	SetOwner	Set the mass of the entity .
_setPosition	Double3D	Set the position “posX”, “posY” and “posZ” to the entity called “name”, if no name is provided, the main entity of the topic will be set.
_setRotation	SetRotation	Set the entity orientation.
_setTorque	SetTorque	Set the torque.
_setVelocity	Double3D	Set Velocity to the entity.
_setWheel	SetWheel	Publish the radius and the distance in a message and they will be applied to the robot.
_setWheelVelocity	SetWheelVelocity	Publish the velocity for the left and the right wheel and it will be applied.

4 Message type

Type name	Parameters
AddForceToParts	name : string part : string x : double y : double z : double
AddJointTorque	name : string parts : string torque : double
Double3D	name : string x : double y : double z : double
Double3D3D	name : string x : double y : double z : double posX : double posY : double posZ : double
MsgRecv	sender : string content : string
OnCollision	name : string part : string
ReleaseObj	arm : string
SetAxisAndAngle	name : string axisX : double axisY : double axisZ : double angle : double
SetCollisionEnable	name : string flag : boolean
SetJointAngle	name : string jointName : string angle : double

SetJointQuaternions	name : string jointName : string qX : double qY : double qZ : double offset : boolean
SetJointVelocity	jointName : string angularVelocity : double max : double
SetMass	name : string mass : double
SetMode	name : string boolean : boolean
SetOwner	name : string part : string owner : string
SetRotation	name : string qW : double qX : double qY : double qZ : double
SetWheel	wheelRadius : double wheelDistance : double
SetWheelVelocity	leftWheel : double rightWheel : double

5 Services

Service name	Type	Description
_check_service	checkService	Check if the service “serviceName” is connected.
_connect_to_service	connectToService	Connect the service “serviceName”, return false if it fails, true otherwise.
_get_all_joint_angles	getAllJointAngles	Get the angles for each joints.
_get_angle_rotation	getAngleRotation	Get the angle of ...
_get_angular_velocity	getVelocity	Get the angular velocity
_get_collision_state	getCollisionState	If part=”main” return getCollisionOfMain-Part.
_get_entities	getEntities	Get the names of the entities in the simulator.
_get_joint_angle	getJointAngle	Get the angle between the joint.
_get_mass	getMass	Get the mass of the entity called “name”.
_get_obj_position	getObjPosition	Get the position of the object named name, if name is empty, return the position of the agent which the service’s name start with.
_get_parts_position	getPartsPosition	Get the position of the part in parameter.
_get_rotation	getRotation	Get the rotation of ...
_get_time	getTime	Get the simulation time.
_grasp_obj	graspObj	Grasp the object “obj” with the part “part”
_is_grasped	isGrasped	True if “entityName” is grasped, false otherwise. If no entity name is provided, it will return the answer for the agent which is asked
_send_msg_to_service	sendMsgToSrv	Send the message “msg” to the service called “name”, return true if it is done, false otherwise.

6 Service type

Service type	Request	Response
checkService	serviceName : string	connected : boolean
connectToService	serviceName : string	connected : boolean
getAllJointAngles	name : string	jointName : string[] angle : double[] length : double
getAngleRotation	axis : string x : double y : double z : double	angle : double
getCollisionState	part : string name : string	collisionState : boolean
getEntities		entitiesNames : string[] length : int
getJointAngle	nameArm : string name : string	angle : double
getMass	name : string	mass : double
getObjPosition	name : string	posX : double posY : double posZ : double
getPartsPosition	part : string name : string	posX : double posY : double posZ : double
getRotation	name : string	qW : double qX : double qY : double qZ : double
getTime		time : double
getVelocity	name : string	vX : double vY : double vZ : double
graspObj	part : string obj : string	ok : boolean
ik	x : double y : double z : double arm : string position : string	done : boolean
isGrasped	name : string	answer : boolean
sendMsgToSrv	name : string msg : string	ok : boolean

7 FAQ

You don't see the robot on the world

Try changing the position of the camera with the keys Ctrl, Maj and/or Alt and the mouse.

SIGViewer has crashed

Don't worry, restart the viewer, it will work.

I can't publish to a topic

Have you started the roscore? If not type on a terminal:

```
roscore
```

If you have started it, have you made a source? If not, type:

```
source ~/catkin_ws/devel/setup.bash
```

fatal error: Controller.h: No such file or directory

If this error occurs, verify if the link to sigserver on the CMakeLists is correct. It should be
/home/<user>/sigverse-<version>/include/sigverse/home/<user>/catkin_ws/src/sig_ros/
src/

Bibliography

- [1] SIGVerse wiki page :
<http://www.sigverse.org/wiki/en/index.php?Tutorial>.
- [2] SIGServer wiki page :
<http://www.sigverse.org/wiki/en/index.php?Tutorial%2FInstallation%20of%20SIGVerse%20server>.
- [3] SIGViewer wiki page :
<http://www.sigverse.org/wiki/en/index.php?Tutorial%2FInstallation%20of%20SIGViewer>.
- [4] ROS wiki page :
<http://wiki.ros.org/ROS/Tutorials>.
- [5] SIGVerse wiki page ROS integration tutorial :
<http://www.sigverse.org/wiki/en/index.php?ROS%20integration>.