WEB TECHNOLOGIES IN JDEROBOT FRAMEWORK FOR ROBOTICS

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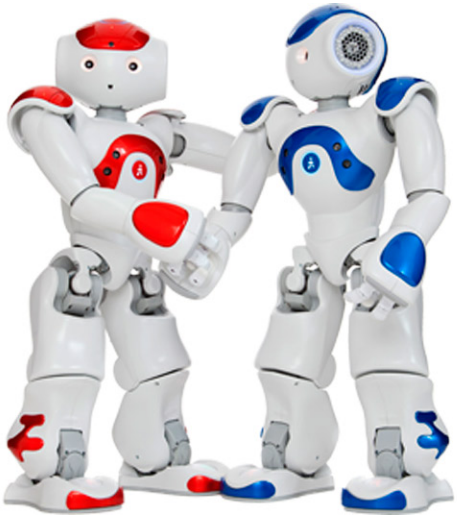
Introduction

In the last years, several robotic frameworks (SDKs) have appeared that simplify and speed up the development of robot applications.

The SDKs facilitate access to the sensors and actuators of the robots.

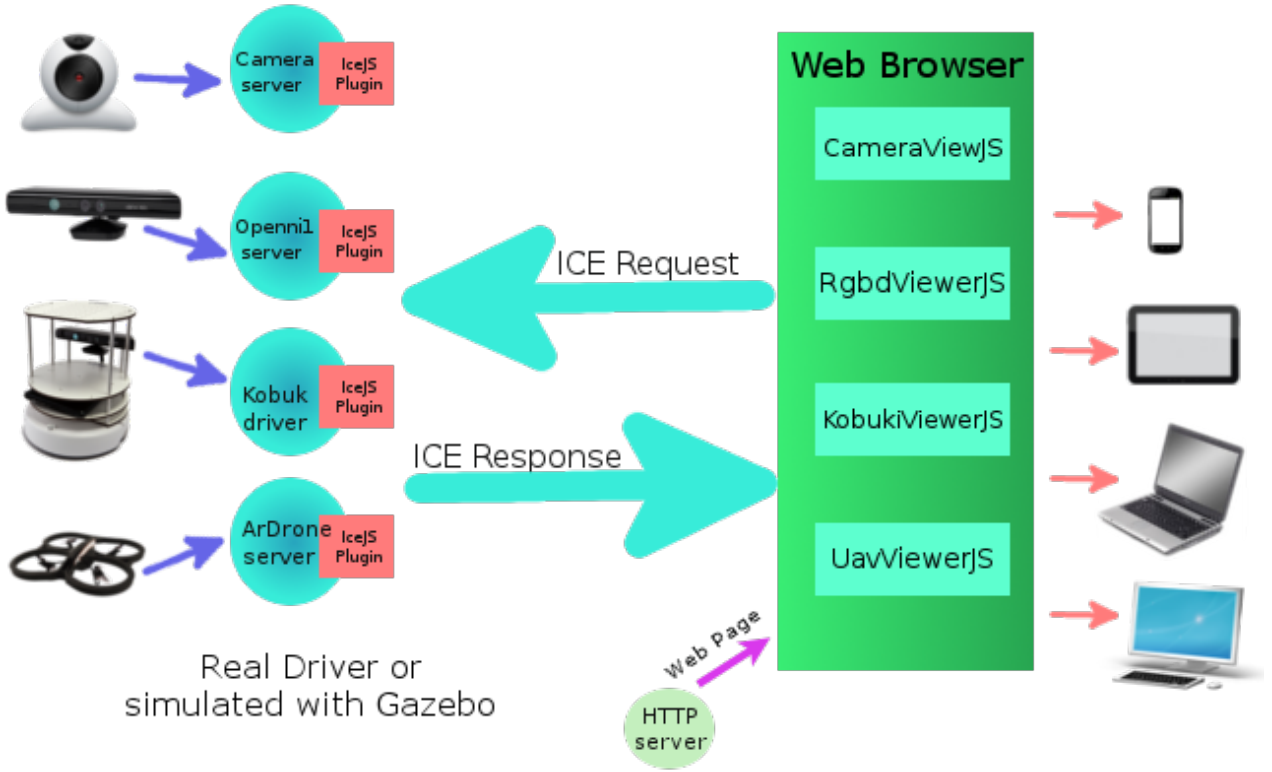


JdeRobot

- Provides a distributed component-based programming environment.
- Components may be written in C++, Python, Java, JavaScript...
- Uses ICE: Allows cross-language and cross-platform communications.
- currently supports Cameras, RGBD sensors, Kobuki, ArDrone,...

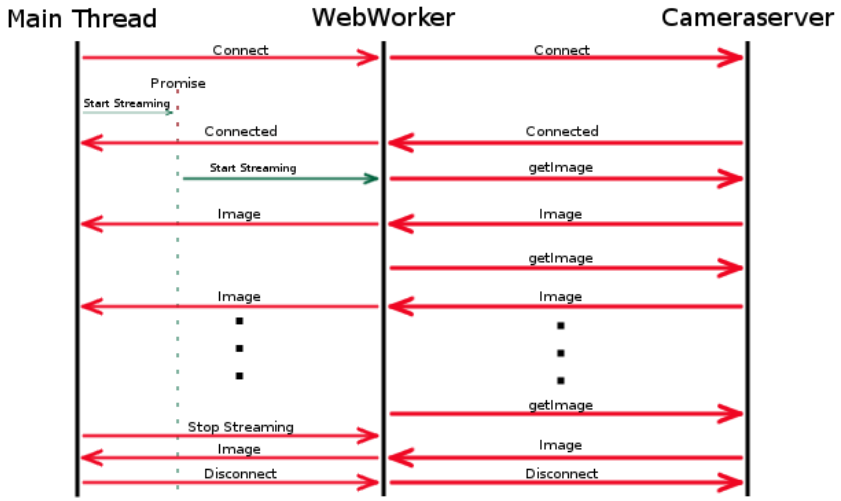
Web Tools

Web tools have been developed using last generation web technologies like HTML5, JavaScript, CSS, WebGL, WebWorkers and WebSockets.



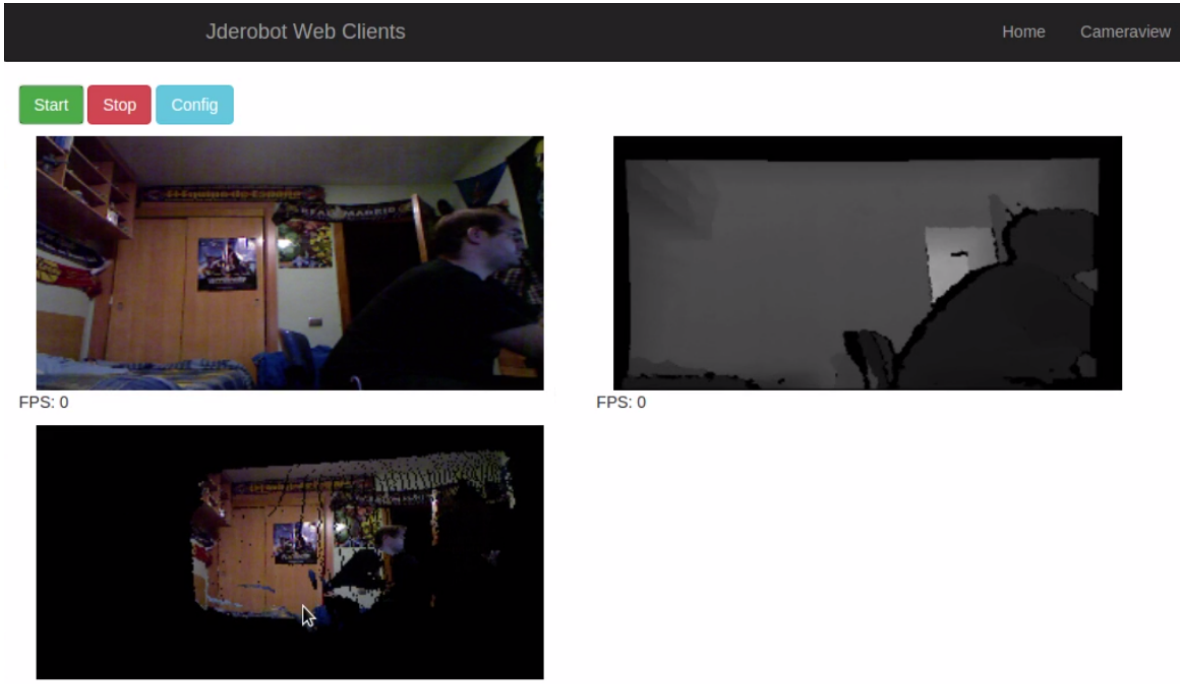
CameraViewJS

- When it is run, the widgets are initiated, creates the *WebWorker* and starts the stream.
- The `connect` function establishes a JavaScript promise that is resolved when the WebWorker indicates that the connection has been established.
- It constantly requests sensor data to the driver and passes them to the main thread.

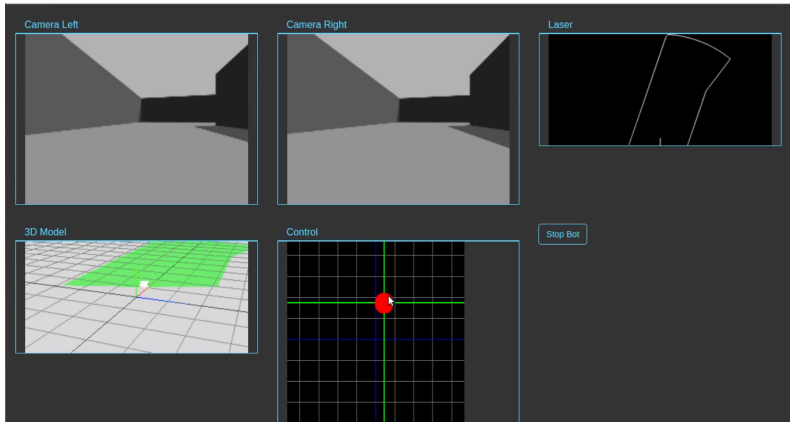


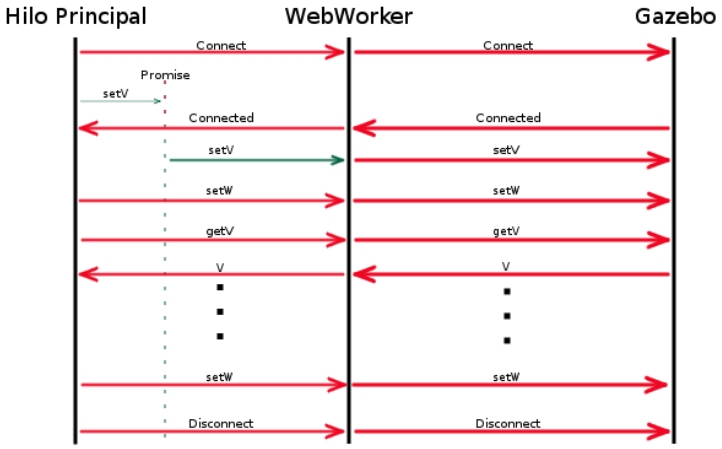
RgbdViewerJS

- Images like in CameraViewJS.
- When two camera images have been received, creates the 3D point cloud and shown in the 3D model.



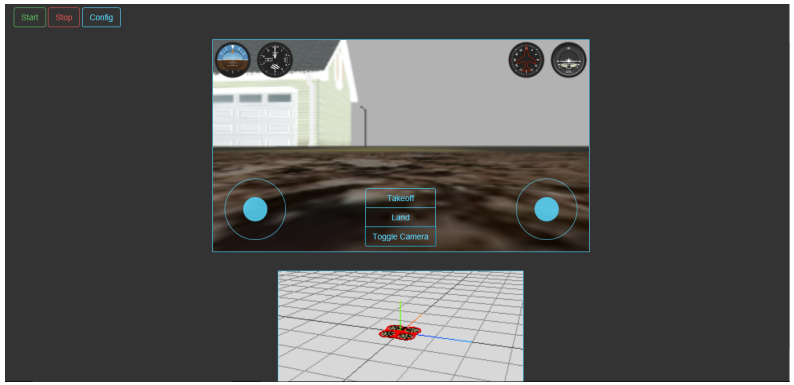
KobukiViewerJS





- Images like in CameraViewJS.
- Whenever it receives a Pose3D, modifies the position and orientation of the robot in the 3D model.
- When it receives information from laser, creates a 2D and other 3D image.
- Whenever you move the control speed orders are sended.

UavViewerJS



- Images like in CameraViewJS.
- Whenever it receives a Pose3D, modifies the position and orientation of the drone in the 3D model and flight indicators are modified.
- Whenever the controls move, speed orders are sent to the drone.
- When the buttons are pressed, take off, landing,... orders are sent to the drone

Experiments

- CameraViewJS.
- RgbdViewerJS.
- KobukiViewerJS.
- UavViewerJS.
- Framerate.

Framerate

CameraServer		Clientes			FPS CameraView	FPS CameraViewJS
Location	Mbps down/up	Kind	Location	Mbps down/up		
Same PC	-	PC	Same PC	-	9	8
Local network	1000/1000	PC	Local network	65/65	6	4
Local network	1000/1000	Mobile	Local network	65/65	-	4
Home	50/5	PC	URJC	15/15	1	1
Home	50/5	Mobile	3G	5/1	-	1
Home	50/5	Mobile	4G	13/4	-	1
URJC	100/100	PC	Home	50/5	6	4
URJC	100/100	Mobile	3G	5/1	-	2
URJC	100/100	Mobile	4G	13/4	-	4

Conclusions

- Four webtools have been created in JdeRobot that allow to teleoperate wheeled robots or drones and to monitor cameras and RGBD sensors from any browser.
- Multitplatform and multi-device
- They use advanced web technologies like WebSockets, WebGL and WebWorkers