GDHE

Graphic Display for Hilare Experiments

http://gdhe.openrobots.org/

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About me

Research engineer at LAAS

- LAAS is a big laboratory of the CNRS
- research in Critical Systems, micro- and nano-systems, automatics and robotics
- working on robotics projects and general IT facilities (security)
- `http://homepages.laas.fr/matthieu/`

Developer for the OpenBSD project. Maintaining X.Org.

Member of the X.Org foundation Board of Directors.

Introduction

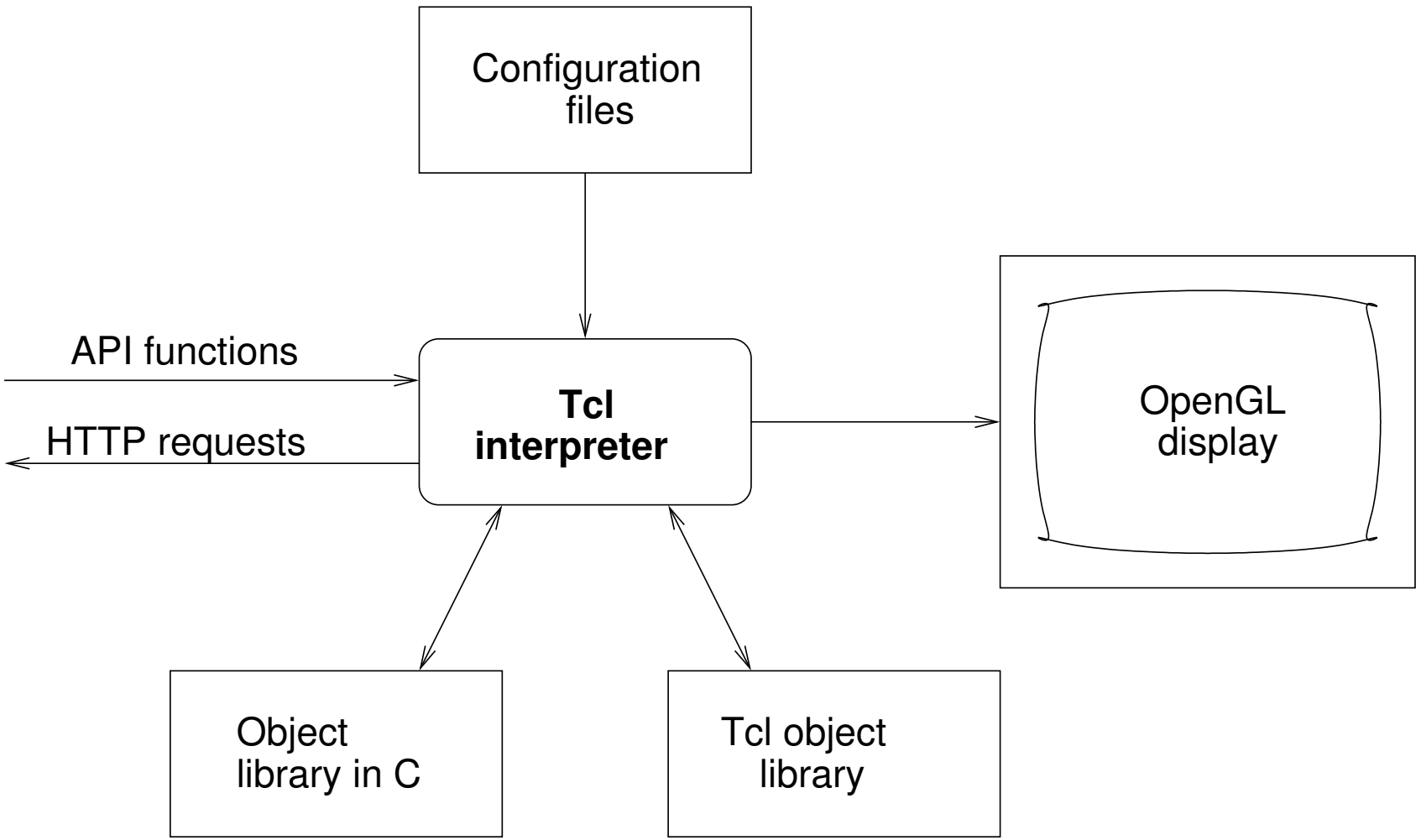
- Gdhe is part of LAAS's open source tools for robotics (`http://openrobots.org/`)
- 3D visualization tool for robotics apps (among others)
- Based on OpenGL and Tcl/Tk
- Pre-defined objects (robots) library
- Exentensible either in C/++ or Tcl/Tk
- Interface with Genom modules
- BSD licensed:
  `http://gdhe.openrobots.org/`

Context and History

- Developed since 1995.
- LAAS decided on an open source license from the beginning
  - GDHE is a support tool developed outside any specific project, not the heart of a research project
  - The rest of LAAS tools (Genom, pocolibs, OpenPRS) became Open Source later in the framework of the Orocos IST project (2001-2003) after an un-successful market study founded by CNRS and ANVAR.
- SUG_3D[1]: 3rd party plugin for SciLab.
- around 10 known users outside of LAAS, a few in domains outside of robotics.

[1] `http://www.scilab.org/contrib/index_contrib.php?page=displayContribution&fileID=289`

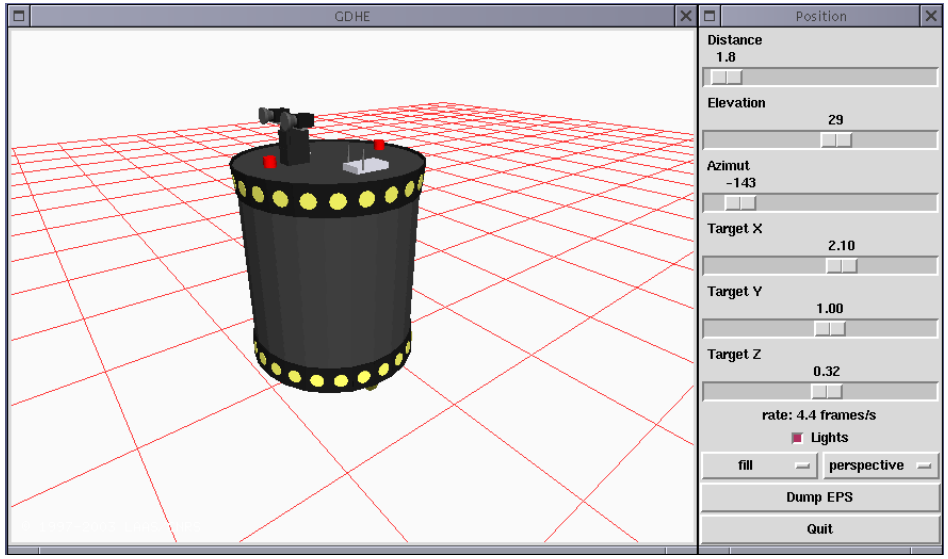
Architecture



Basic use

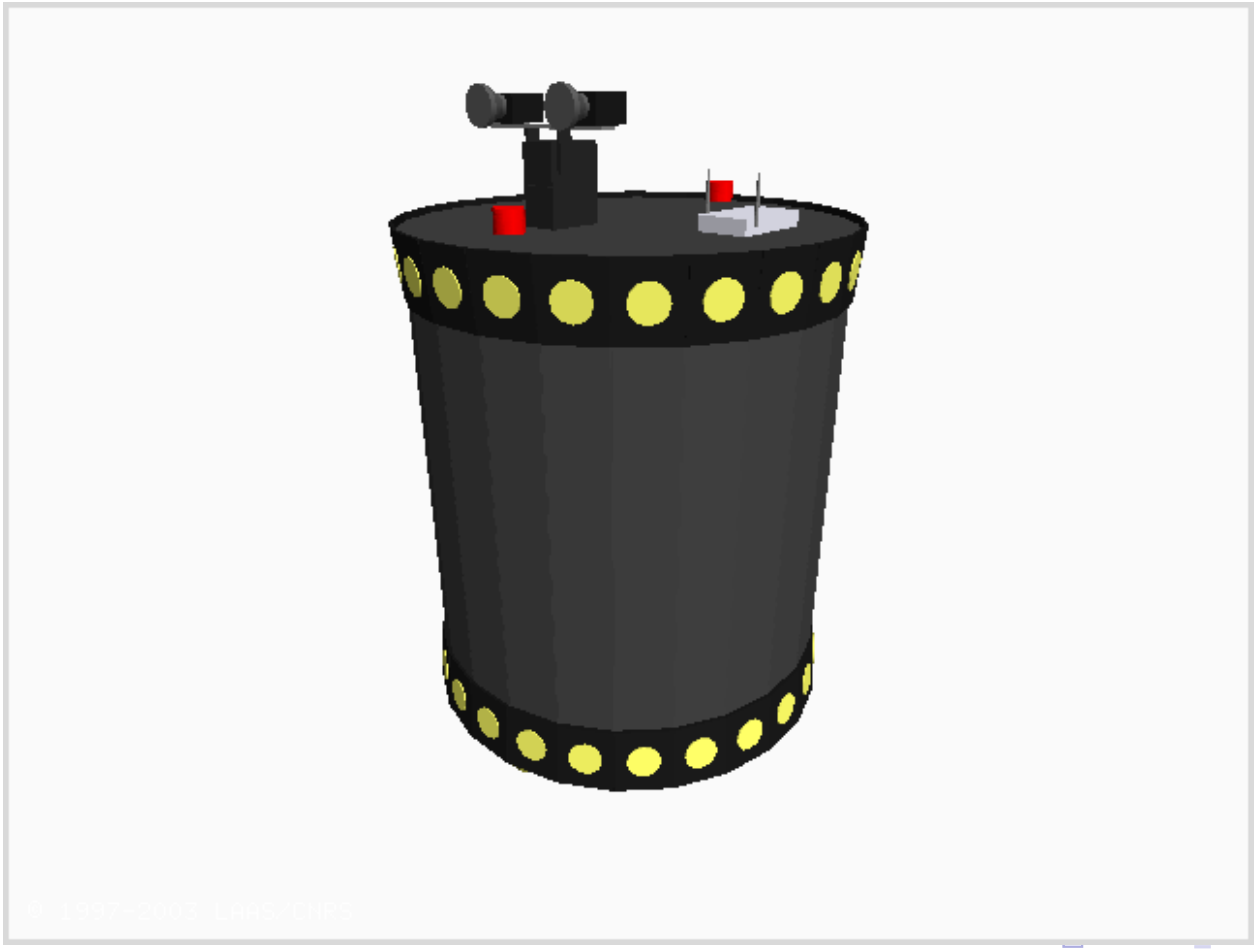
Scene componants :

- observer - position defined by Tcl variables
- objects
  - defined by Tcl procedures in the `robots` array
  - positions (3 or 6 components) in the `pos` array
- background



1st example

```
set robots(r1) xr4000
set pos(r1) { 0 0 0 }
```

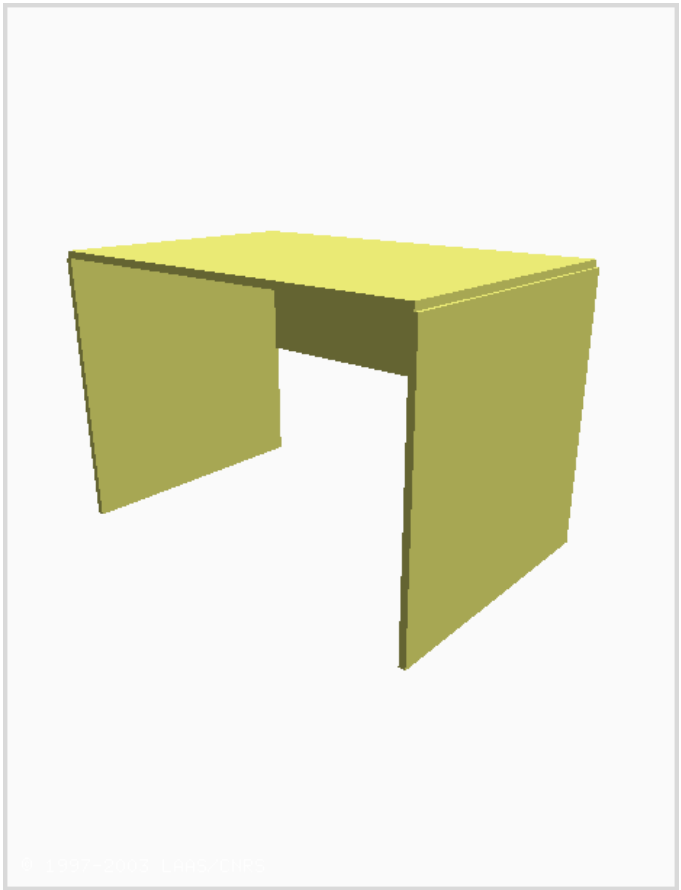


Objects

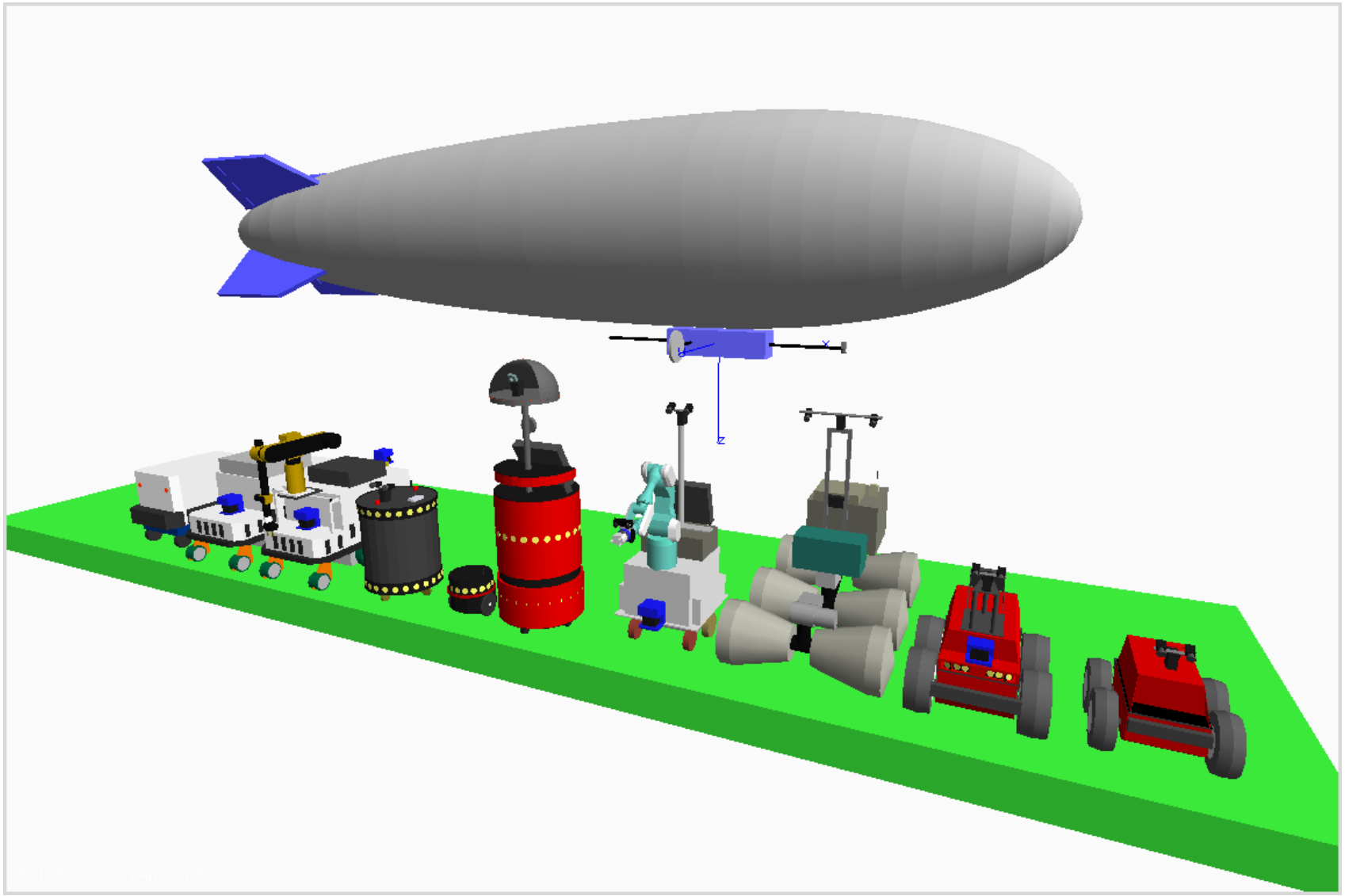
An object is displayed by a procedure drawing its components.

Example:

```
proc desk {} {
    pushMatrix
    translate 0.6 0.4 0
    color 200 200 100
    # Upper plane
    box 0 0 0.8 1.20 0.8 0.02
    # sides
    box -0.6 0 0 0.02 0.8 0.8
    box 0.6 0 0 0.02 0.8 0.8
    # bottom
    box 0 0.4 0.4 1.20 0.02 0.4
    popMatrix
}
```



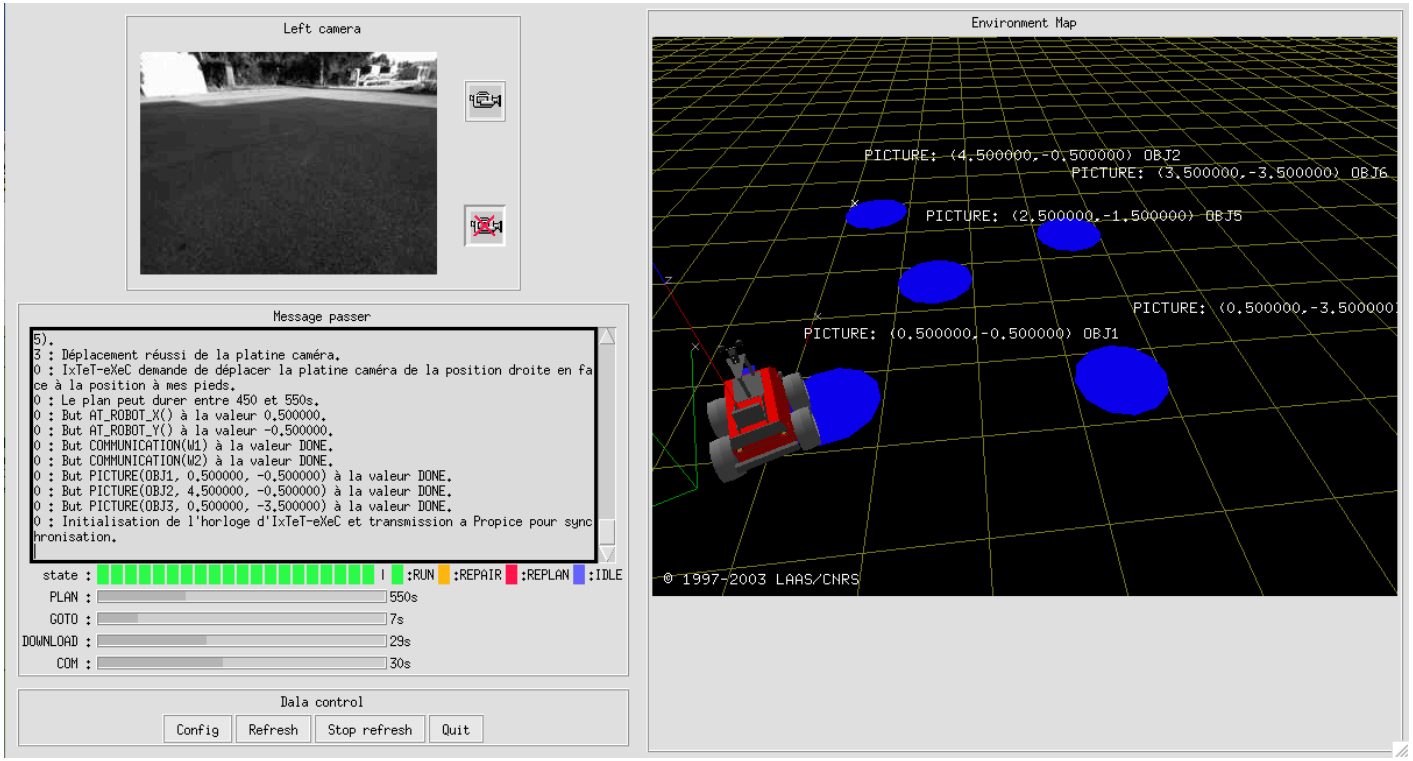
Pre-defined objects



Graphical User Interface

The GDHE GUI is programmable (Tk).

→ Embed the Gdhe viewer in a more general control interface.



Retrieving XML data via HTTP

One way of displaying data - data retreived by HTTP.

picoweb: little web server dedicated to Genom modules:

- listens on port 8080
- standard CGI scripts generated by Genom
- read the posters and produces XML data structures
- plugins for dynamic posters or specific data structures (images)

http : standard Tcl package handling HTTP requests

tdom : standard Tcl XML parser package

$\rightarrow$ Tcl scripts to spy posters and update GDHE's models.

Extension

Gdhe is extensible through Tcl modules which can provide:

- new object models
- OpenGL primitives (triangle mesh)
- helper functions

Existing modules:

terrain	display of DTM
planet	display of “planets” (textured spheres)
tkjpeg	support for JPEG images in Tk’s image widget.
velodyne	display point clouds produced by the Velodyne LIDAR in real-time
...	

Future work

- more plugins : import foreign object models (collada, urdf,...)
- rendering enhancements (transparency, materials)
- object models rework, including hierachy & selection

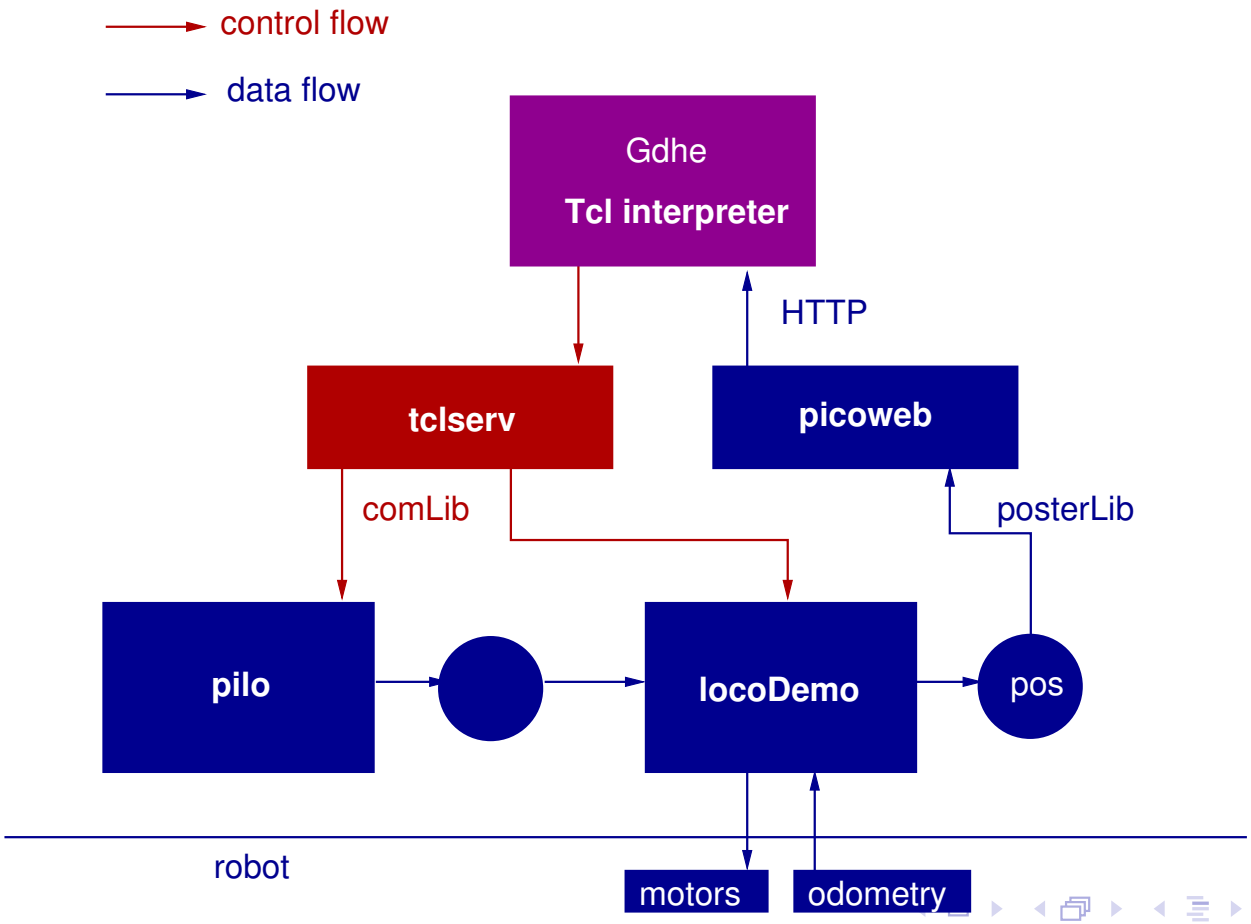
But keep it simple and lightweight.
Don't compete with Blender, Gazebo, or VTK...

Conclusion

- 3D visualisation is a basic need in the fields of robotics and mobile embedded devices.
- GDHE provides a simple, yet versatile and powerful tool
- Well integrated with the rest of the LAAS architecture
- Has been used in many different projects and contexts at LAAS
- A few external users (no real motivation/investment to create a wider community)

Demos

- this presentation was shawn using Gdhe...
- sample video that was created using Gdhe (Comets project)
- `pilo-demo`



Questions ?