From s-bot to SWARM-BOT

Project's web site: `http://www.swarm-bots.org`

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FET

Autonomous System Lab

S-bot : a highly mobile robot, with 9 DOF, high computation power and plenty of sensors

Sensors

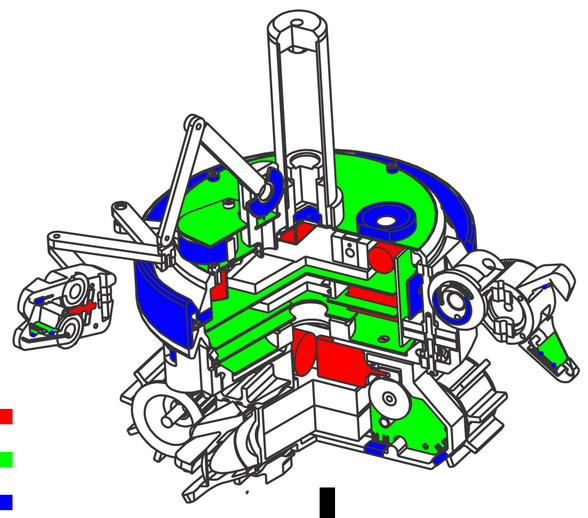
- 1 VGA camera
- 4 microphones + 2 speakers
- 19 IR distance (15 around, 4 bottom)
- 4 accelerometers (3D orientation)
- 2 humdity and temperature
- position and torque on all motors
- color light and sensor ring
- optical barrier in gripper

Computation

- XScale 32 bits ARM CPU @ 400 Mhz. 64 MB RAM and 32 MB Flash
- CompactFlash for storage and wireless ethernet.
- Linux familiar operating system
- 12 PIC µC @ 20 Mhz
- I2C bus

Actuators

- 2 Treels© (2 DOF)
- Turret (1 DOF)
- "Fixed" gripper (2 DOF)
- "Mobile" gripper (4 DOF)
- Total : 9 DOF, 7 motors, 2 servos



SWARM-BOT : an higher level structure, consisting in s-bots connected together

Gripper

Passing a gap

Passing a step

In these examples, the SWARM-BOT is built of s-bots interconnected using their "fixed" gripper. The "fixed" gripper has a degree of freedom with sufficient torque to lift and hold another s-bot.
Then the SWARM-BOT can pass a gap or a step that would have been too big for a single s-bot. This approach finds its theoretical roots in recent studies in the field of swarm intelligence.

Ishtar, an architecture for robotic control and monitoring

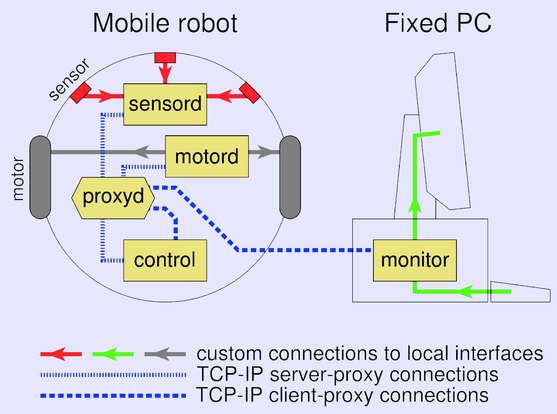
What is Ishtar ?

A software architecture, with its implementation (free software, GPL).
A set of C++ libraries and programs, without any dependencies.
It provides remote access to robot's sensors, actuators and any other “variable”, all called services.
It provides dynamic enumeration of the services.
It allows concurrent access from several clients.

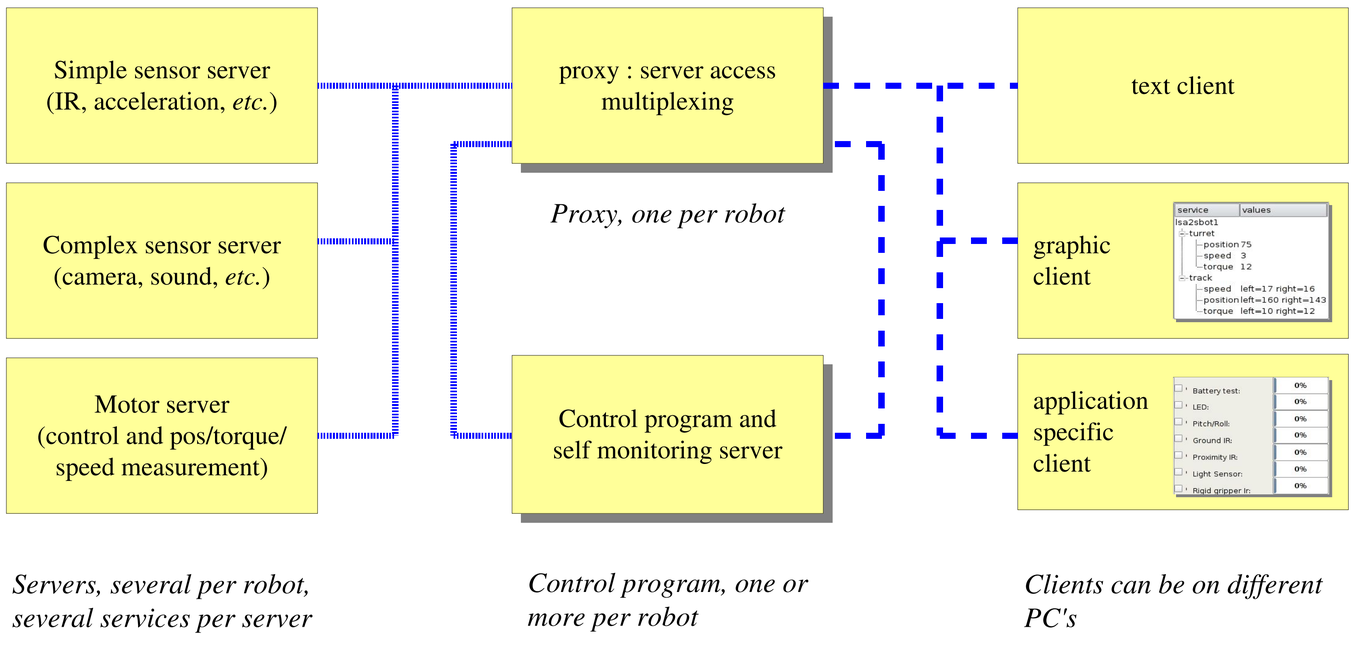
Ishtar *vs* the world

Lots of other systems similar to Ishtar :
DCOM, Corba, DCOP, IPC, Java's RMI, DPS, *etc.*
But Ishtar has unique features :
Very small (1835 lines for core libraries and proxyd
Very embeddable (depends only on C++ and TCP sockets)
Clean, modern C++ code
Dynamic enumeration of services

Ishtar in a Khepera-like robot



The big picture



Ishtar's future

Ishtar is the foundation of our next generation software.
It will be used to allow real-time software reconfiguration, using the same client as for monitoring.
It is a work-in-progress, although already working and providing solid base for s-bot development.
One future feature is an isochrone-like transfer, allowing data streaming from services to clients without polling.
Contributors are welcome, join us and use Ishtar in your own project.
There is no dedicated web page yet, but
You can send me a mail at `stephane.magnenat@epfl.ch`
You can give feedback on the Ishtar dedicated area on our Wiki at `http://lsa2backup.epfl.ch/wiki`