ULISSE HPC

UNIVERSAL LANDER FOR INTERSTELLAR SPACE EXPLORATION
HIGH PERFORMANCE COMPUTING

by

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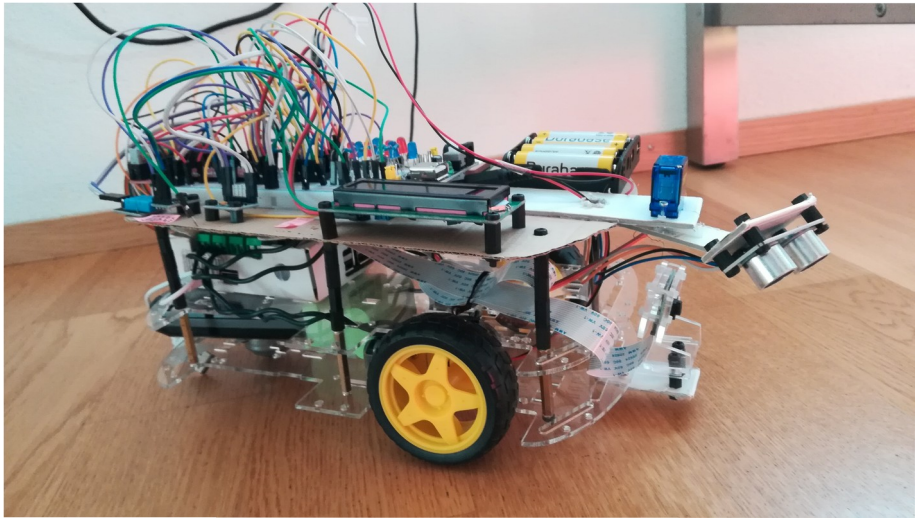
YouTube: https://www.youtube.com/channel/UCDNomXKPI-qkB3vEt4UxPUg

GitHub: https://github.com/BulunSkunkWorks/UlisseHPC

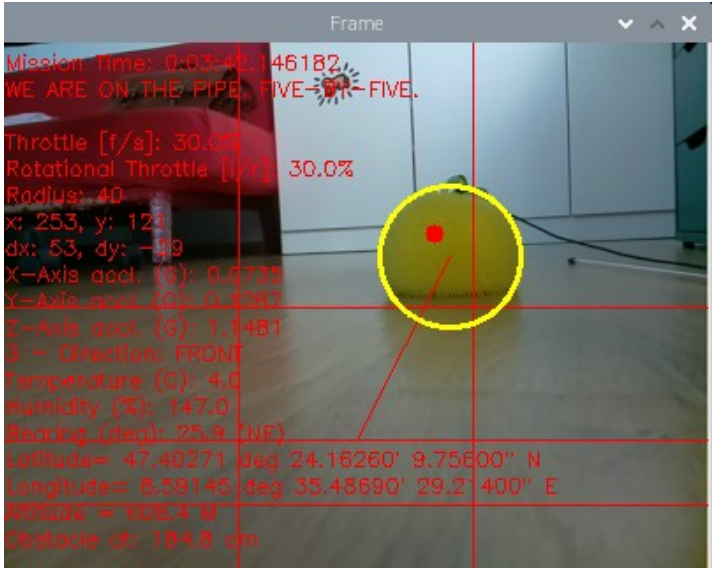


Pi WARS
The Raspberry Pi Robotics Challenge Competition

Pi WARS 2021 AT HOME

MAIN FEATURES

- Autonomous driving 2WD Robot.
- Steering via object tracking using OpenCV: determines ball position on screen.
- Object avoidance with Distance Sensor mounted on Servo Motor.
- Task-Farm High Performance Computing framework implemented with MPI4py.
- Framed Output of Computer Vision + navigation information



- Additional Features (some for future development):
  - GPS, 3-axis Accelerometer, Compass.
  - LCD
  - Temperature and Humidity measurements.
  - Shift register with 8 LEDs.

TECHNICAL SPECS

- Raspberry PI model 3B with 1 GB of RAM and 1 GHz quad-core Arm CPU
- Raspberry PI Camera 5MP
- Motor Shield from SB Components
- GPS Module NEO 6M
- Distance sensor HC-SR04
- Micro Servo SG90
- DHT-11 sensor for humidity and temperature detection
- ADXL345 3-axis Accelerometer.
- QMC5883L 3-axis Compass.
- LCD 1602.
- Shift Register 74HC959 to activate 8 LEDs
- Chassis equipped with 4 Gear Motors.
- Battery for Raspberry PI of 5V.
- Battery for Motors of 7.2 V.
- Breadboard Power.
- 10 Various resistors 220 Ω.
- About 6 meters of wires.

HIGH PERFORMANCE COMPUTING FEW WORDS...

What it is

It is the practice of aggregating computing power in a way that delivers much higher performance than one could get out of a typical desktop computer or workstation.

Ulisse implements the HPC Framework called Parallel Computing (aka Task-Farm).

Purpose

It is used to solve large computational problems in science, engineering, or business.

What it is NOT

Just a cluster of computers connected to network.
Just a Multi-processor server.

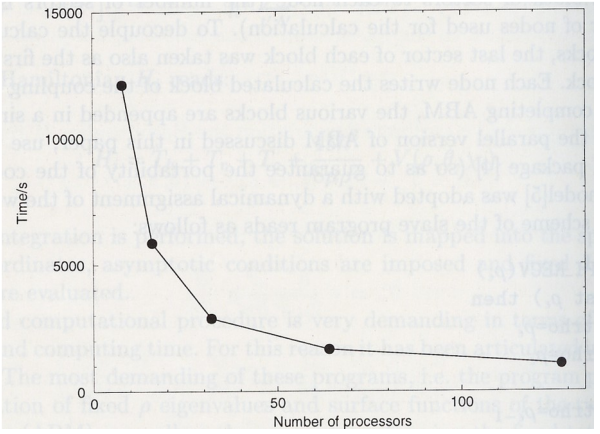
EXAMPLES OF HPC... FROM 1998!

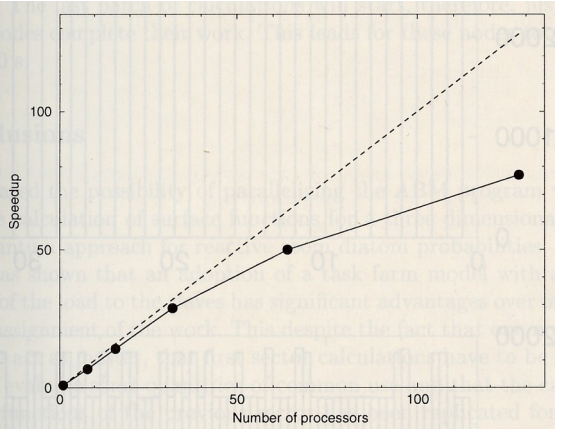
Cray T3E

Number of Processors (Digital Alpha):
- 256 at the EPCC, UK
- 128 at the CINECA, IT

256 MB Ram / Processor
1 GB Disk User space

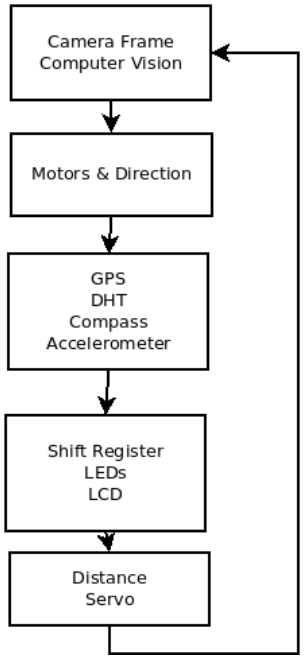
Performance Benchmarks of a Quantum Reactive Scattering computational code run on the T3E @ CINECA.

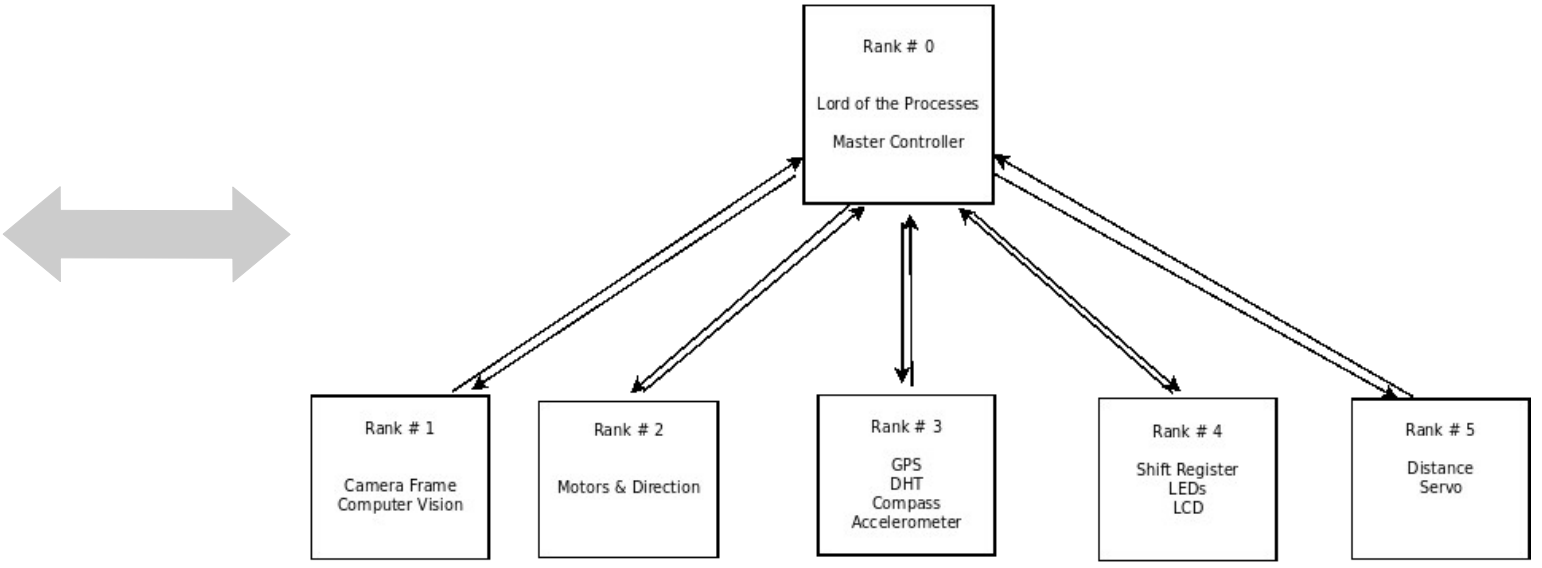




Source: Lecture Notes in Computer Science # 1497 – A. Bolloni et at - 1998

THE ULISSE HPC FRAMEWORK





sudo python Ulisse.py

sudo mpiexec --allow-run-as-root -hostfile hostfile -np 6 python UlisseHPC_v1.0.8.py