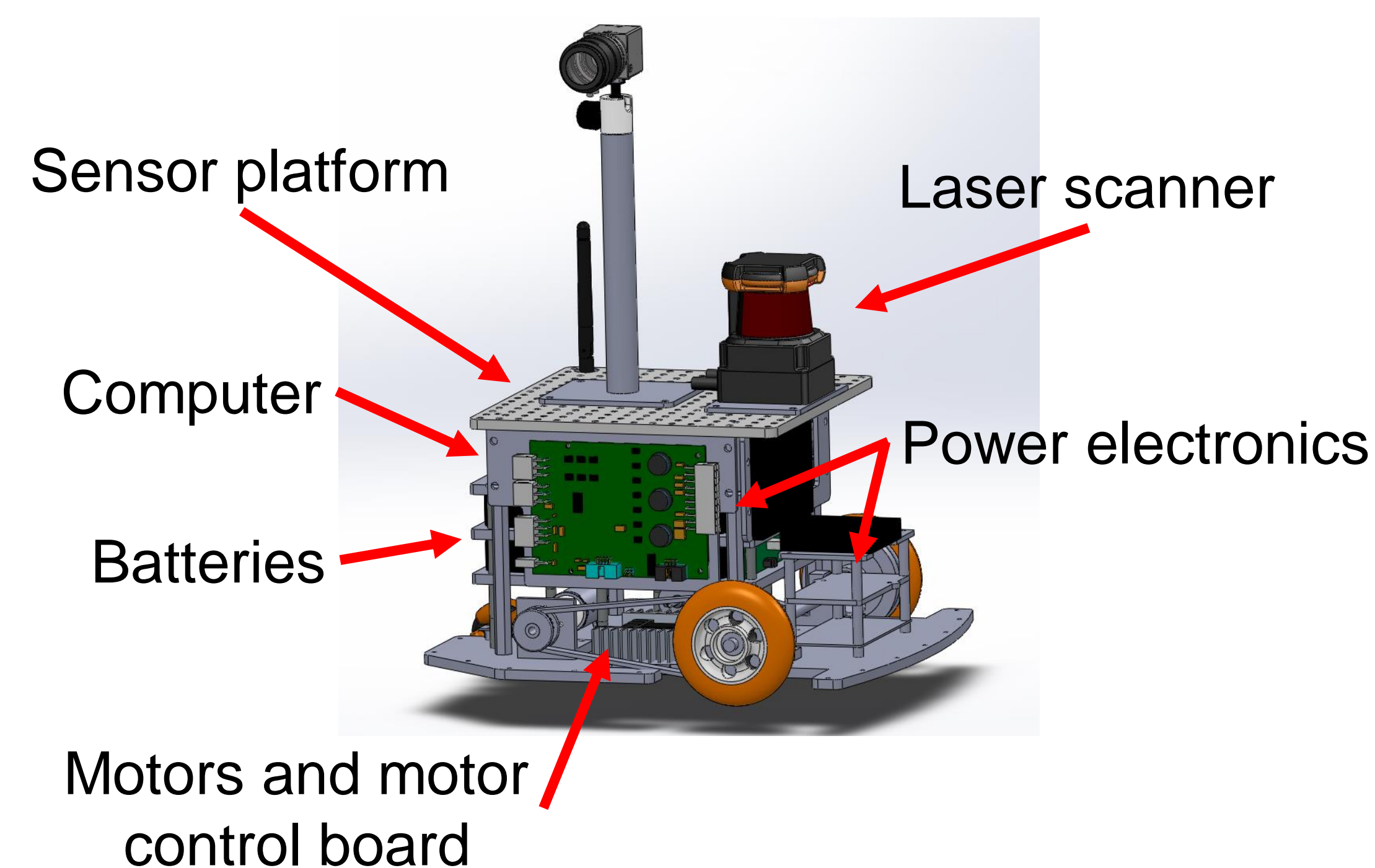


Hardware



Computation

- 3.4 GHz Intel i5 processor
- 8 GB RAM
- 40 GB SSD
- 802.11n wireless card
- Ports: 6 USB, 1 firewire, 1 Ethernet
- Ubuntu 14.04

Power

- 2 hot-swappable, 6700 mAh Li-ion batteries
- ≈ 90 min. battery life

Actuation

- 2 Maxon brushed DC motors
- Max speed ≈ 0.8 m/s
- 1 passive omnidirectional wheel

Sensing

Hokuyo UTM-30LX

- Planer laser scanner
- 270° field of view
- 30 m max range
- 1080 beams/scan



Asus XTion

- RGB-D sensor
- $58^\circ \times 48^\circ$ field of view
- 5 m max range
- 640×480 resolution



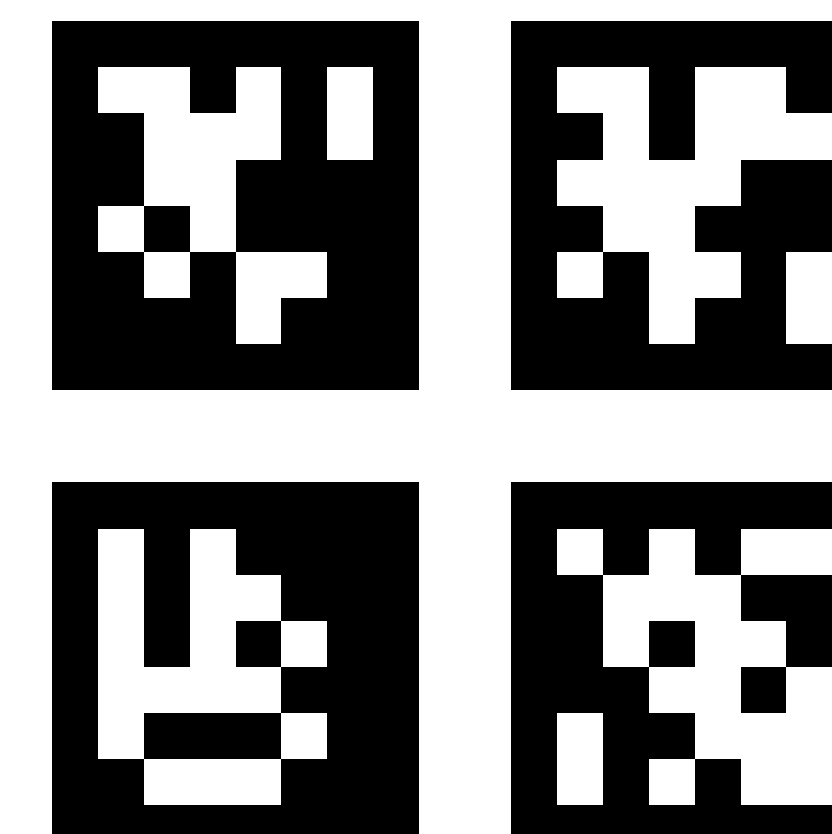
Foscam IP Camera

- RGB camera
- 60° viewing angle
- 640×480 resolution
- Pan/tilt capabilities



April Tags

- Uniquely identifiable fiducial markers
- Used to localize and detect objects from camera images
- Use ROS package `apriltags_node`
- Developed by April Robotics Laboratory
- <https://april.eecs.umich.edu/wiki/index.php/AprilTags>

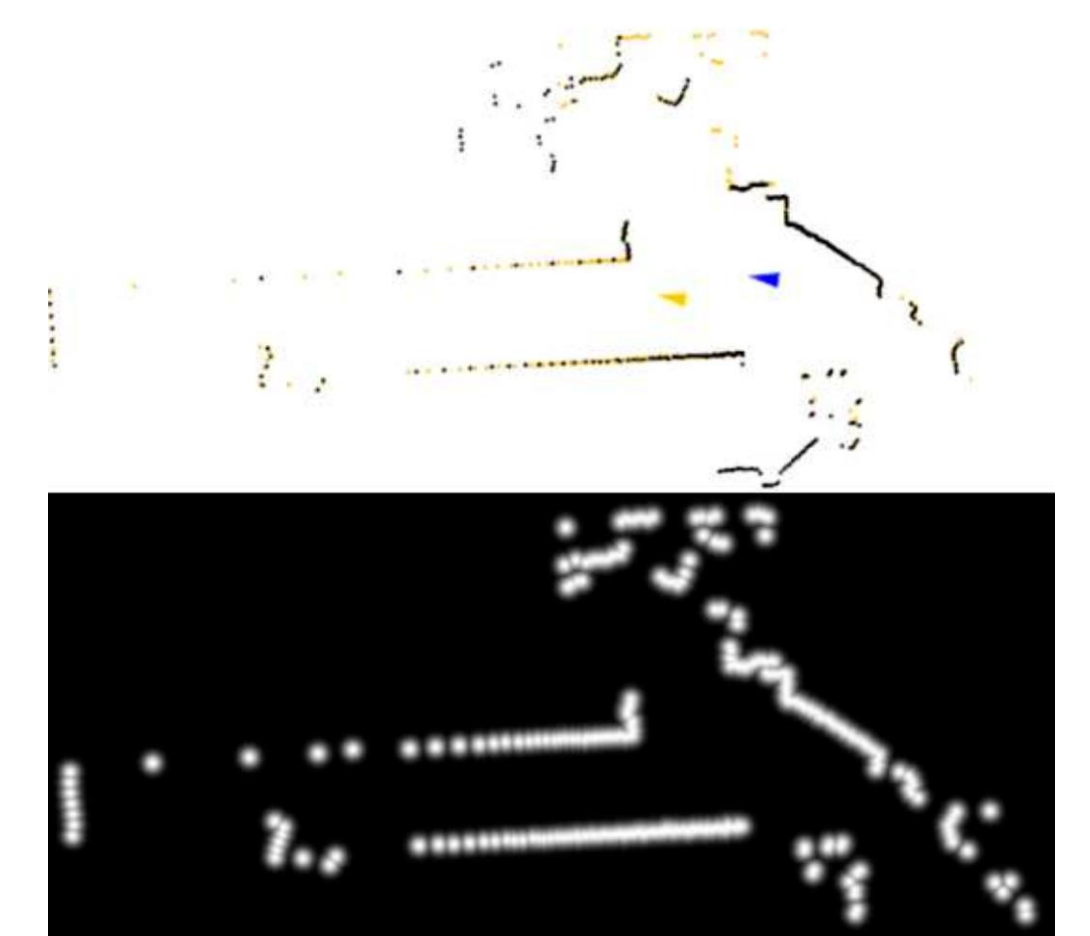


Software

- Available at: <https://github.com/bcharrow/scarab>
- Written in C++ and python
- Uses ROS Indigo for inter-process communication

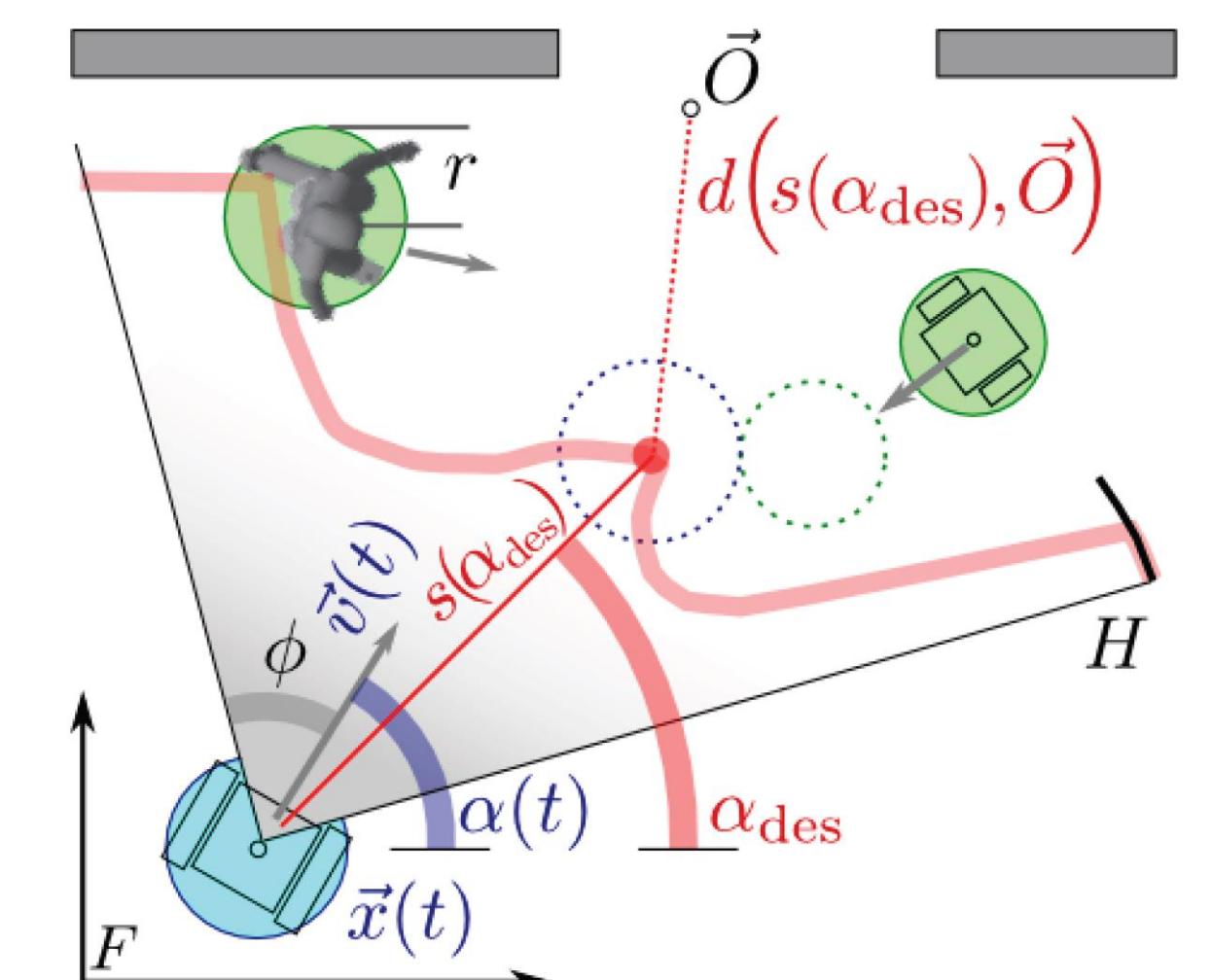
Laser-based Odometry

- Builds a local map using laser scans
- Map decays over time
- Match scans to determine robot motion
- Implementations of
 - Olson, Edwin. "Real-time correlative scan matching." *IEEE International Conference on Robotics and Automation (ICRA)*, 2009.



Navigation

- Plan path through environment
- Inflate obstacles in current laser scan
- Drive to free space
- Implementation of:
 - Guzzi et al. "Human-friendly robot navigation in dynamic environments." *IEEE International Conference on Robotics and Automation (ICRA)*, 2013.



Mapping

- Use ROS `gmapping`
- RBPF-based SLAM
- <http://wiki.ros.org/gmapping>

