



First Calliope Prototype

Motivation:

- Calliope is a new platform for mobile manipulation.
- Calliope is being jointly developed by Carnegie Mellon University, Florida A&M University, and RoPro Design.
- The goal is to create a low cost, open source platform suitable for teaching vision, navigation, and manipulation.
- Educators need an affordable robot with these capabilities.

Objective:

- Meet core functionality requirements with retail cost < \$2.5K:
- Vision: recognize objects and landmarks.
 - Navigation: localize, path plan, track landmarks.
 - Manipulation: grasp and move objects.

Technical Approach:

Use commodity subsystems (iRobot Create, ASUS Eee 900 PC) to exploit economies of scale and minimize design complexity.

Use Robotis Dynamixel AX and RX series servos for pan/tilt and arm; Logitech webcam for vision. Keep custom-fabricated parts to a minimum: camera mount, arm links, gripper fingers.

Provide full support in the Tekkotsu software framework for all robot capabilities. Player/Stage support is also being developed, by another group.

Results To Date:

- Robot can track bicolor markers using its pan/tilt.
- Basic arm control by setting joint angles.
- Standard Tekkotsu motion and navigation capabilities.

Future Directions and Areas Needing Attention:

Further refinements to the arm and gripper design are planned. 3D arm grasp and path planning need to be added to Tekkotsu. Servos are powered by a 12V NiMH battery, but the Create's own battery could be used instead. RoPro Design will sell the platform fully-assembled; users can also build their own if they wish. Plans will be on the web.

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