**ABSTRACT**

Microsoft’s Kodu Game Lab is a programming environment designed for young children. Kodu programmers create computer games by writing behavioral rules for animated characters. This research develops strategies for mapping Kodu’s idealized perception and manipulation primitives onto real robots, which have significant physical constraints. Our target platform is the Calliope2SP robot.

**PROBLEM DESCRIPTION**

In Kodu’s virtual environment, perception and manipulation are instantaneous, omnidirectional, and never fail. On a real robot, vision is slow, expensive, and limited to where the camera is pointed. Also, a robot can only manipulate an object within the gripper’s reach, and because gripping is unreliable, the gripper may lose the object while the robot is moving. For these reasons we need strategies to reliably implement Kodu’s primitives on a real robot such as the Calliope2SP.

**RESOURCES**

**KODU GAME LAB**

- Uses rule-based programming to control Kodu characters.
- Makes programming perceptions and actions easy and intuitive.

**METHODOLOGY**

1) Analyzed how Kodu’s rule interpreter works.
2) Wrote a detailed description of Kodu perception and manipulation primitives.
3) Examined the perception and manipulation differences between Kodu and the Calliope2SP.

**TEKKOTSU**

Free, open source project developed at CMU.
- Enables high-level programming on multiple, predefined robotic platforms.

**THE CALLIOPE2SP ROBOT**

- Designed by RoPro Design, Inc. with CMU.
- Approx. 1 foot in diameter and 1.5 feet high.

**PROPOSED STRATEGIES**

**PERCEPTUAL MULTIPLEXING**

Compiling a visual perception routine and dividing the robot’s attention between:
- Detecting bump events
- Tracking distant objects
- Detecting landmarks for localization
- Monitoring a grasped object

**ADAPTIVE NAVIGATION**

- Dead reckoning vs. visual homing.
- Knowing when to use each technique based on its capabilities and efficiency.

**FAULT-TOLERANT MANIPULATION**

- Acquiring and manipulating objects with the gripper.
- Detecting and recovering from failures.
- Knowing when to push in lieu of grasping an object.

**FUTURE WORK**

- Implement our proposed visual perception, adaptive navigation, and object manipulation strategies.
- Add other primitives that require inter-robot coordination such as give.

**REFERENCES**
