CSC 714 Project Proposal

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Motion Tracking with the RCX and Quickcam

Project Url: http://www4.ncsu.edu/~jjwinega/714proj.html

Abstract
We propose using the Lego Mindstorms RCX in conjunction with a Logitech Quickcam to provide a motion tracking system. We will set up a system such that a camera will keep a small object, such as a ball, in the center of its field of view.

System Basics
We will set up an apparatus which mounts the Quickcam on rotating Lego bricks. Software running on a Linux based PC will capture frames from the camera, process the images, and then send signals through the IR port of the RCX to control the motion of the camera. Thus, there needs to be some timing mechanism in place to coordinate between the RCX unit and the PC software.

Challenges
The challenges on the PC end include image processing and communication over IR.
- We will look to use existing software to help us process frames in order to determine the motion of an object. If the software we find is either not appropriate or difficult to integrate, we will develop our own code to do whatever image processing is needed.
- The PC end will also need to send data over the IR port to the RCX brick. Solving this problem will involve modifying code which currently performs the 'dll' functionality included with BrickOS.

With the RCX, the major challenges will be to receive commands over the IR port and then control the movements of the camera.
- Communication through IR should be achievable through the LNP portion of the BrickOS API.
- Control of the camera should be done through simple motor control. However, a well thought-out design must be used for

the physical setup of the camera apparatus. In order to produce acceptable tracking, the RCX must control the direction that the camera is facing as precisely as possible.

Outline

    A. Obtain Linux driver for Quickcam and install it
    B. Download and Install Improv motion-detection software and learn how to use it
    C. Design and implement communication protocol between RCX and PC via LNP
    D. Code actuator motion to move camera around on top of RCX
    E. Link Improv motion-detection to actuator code

References
[1] LNP: http://legos.sourceforge.net/HOWTO/x405.html
[2] LNP Notes: http://www.docs.uu.se/docs/undergrad/instances/spring2002/RTSystemDvpMnp/assignments/notes_on_lnp.html
[3] legOS Networking Protocol Domain: http://legos.sourceforge.net/files/linux/LNPD/
[4] QuickCam Driver: http://qce-ga.sourceforge.net/
[5] Video4Linux: http://www.exploits.org/v4l/
[6] Improv: http://www.ee.uwa.edu.au/~braunl/improv/