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Formal Proposal

Special Sensor Report

CMUcam2 Vision System

Table of Contents

Introduction	3
Purpose	3
Benefits	3
Problems	3
Interface	4
Conclusion	4

Introduction

Delivery Boy will need to be able to have knowledge of where the ball is located on the platform. The best way that this 2-dimensional tracking can be done is with the use of a camera. I chose the CMUcam2 to meet this requirement.

The CMUcam2 is a low resolution camera that is interfaced with a microcontroller. This allows high level data to be accessed from the camera. Although the cameras quality leaves much to be desired, I do believe that it will be able to provide Delivery Boy with the necessary ability to track a ball.

Purpose

Delivery Boy will need to be able to keep a ball on it's platform while moving around a room. A key part of accomplishing this tack will be knowing the location of the ball. The purpose of this camera will be to provide Delivery Boy with this information. The CMUcam2 will be placed so that is can view the entire platform. One advantage that I will have while using this camera is that I will have control over what is in view of the camera. That is, the camera will only be looking at the ball and the platform.

Benefits

The CMUcam2 does provide many benefits that makes it an attractive candidate for image processing. The first reason that I chose this camera is its size. Although the camera did not provide a good mounting option, It is small and light enough to place on a stand over the platform. Another benefit this camera provides is the on-board image processing. This allows me to simply send commands to the camera such as TC (track color) and the camera will stream back the position of the color that is being tracked. Cost was another factor in choosing a camera. At \$160, the camera does provide an affordable vision solution.

Problems

The main problem that I have found while using this camera is that it requires a great amount of light in order to properly differentiate colors. In normal lighting conditions, everything the camera sees has a dark red tone. This must be addressed before any reliable data can be obtained. My only other complaint is that the camera does not seem to be designed so that it can be mounted easily. There are only two holes available and they are too small to fit normal board-mounting screws into them. Also, the actual camera is located on a separate chip and the only thing holding the two together are the header pins. So even if you are able to securely mount the CMUCam with the two holes provided, the actual camera is still able to rock back and fourth with no way of securing it.

Interface

The CMUCam's communication interface turned out to be very easy to use. It is controlled and provides data by the use of serial data transmission. It is configurable to use seven different baud rates and can accept or send data at either TTL levels (0V to 5V) or RS-232 (-12V to 12V) levels. For example, If tracking a color was the objective of the camera, the command could be sent as:

```
TC 200 255 0 65 20 72/r
```

This would tell the camera to Track the Color which red value is in between 200 and 255 and green color is in between 0 and 65 and blue color is in between 20 and 72. The camera would then return a packet that would look like this:

```
T 23 45/r
```

This tells the user that the object that was to be tracked is located on in the cameras view on (23,45). That is, 23 pixels to the right and 45 pixels down.

Conclusion

Although the CMUcam may not be the best choice for complicated image processing, It should provide Delivery Boy with enough information to be able to complete its task, balancing a ball on top of its platform.