READ ME

Links to videos

RGB, Yellow and White maze with Colour calibration: https://youtu.be/nCGtSAlKUpI

Pink, orange and light blue turns: https://www.youtube.com/shorts/H_EKDQv4YHE

Black Colour Response : https://youtube.com/shorts/_3GoKSyJcNE?feature=share

Hard maze Thursday session: https://youtu.be/CCSiGOHebfs

General Overview

The buggy works on the basis of interrupts, both for the forward motion (where it senses the colours) and in the reverse mode, where it retraces its path back to the start position.

The interrupt works on the basis of the clear value sensed by the colour clicker going out of the range specified in the start of the sequence. Once the interrupt is triggered the buggy will go into a sequence where it checks whether it should go forward or continue retracing.

The motor response function is a char function, which returns a number corresponding to the colour it has sensed. The number is stored in an array, which is then used for the retracing function.

The retracing function works on the basis of using the stored number in the arrays to retrace its motion. The feature of this function is that it sends a command to the buggy to do the opposite of the colour it had sensed on its way forward, so that the retracing can occur without any issues.

Calibration Procedure

There is a calibration procedure in place for the colors the colour clicker reads. The motor response function takes normalised values of RGB and clear to distinguish between the colours. The RGB values are normalised against the clear values read by the colour clicker at the point of interrupt and the clear value is normalised against a standard value of 2385, which was found to be the clear value of the colour black. A sample graph of RGBC values of color card readings is found in figure 1.

The calibration sequence starts off by reading the RGBC values of the following in order: Yellow, Pink, light blue, Green, Dark Blue and finally ambient.

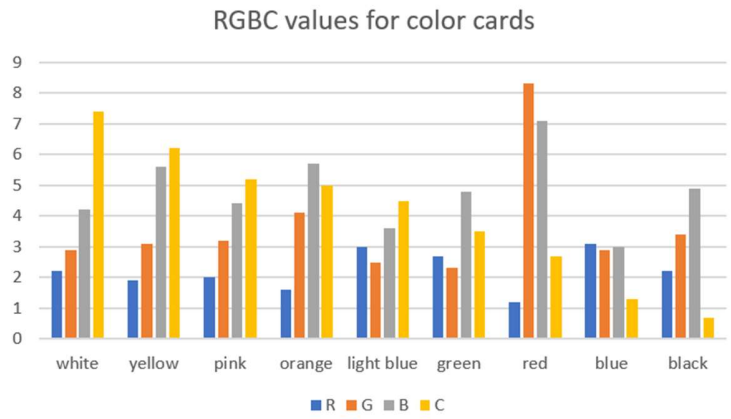

Figure 1. RGBC values for color cards

Threshold Values

The threshold values are taken by distinguishing the normalized RGB and clear values. As mentioned previously, the RGB values are normalised against the clear value obtained from the card, while the clear value is normalised against the clear value of black.

The motor_response function is first divided into three big ranges, as the normalised clear value is sufficient to put multiple different colours in different groups. Once inside each if statement, there are additional if statements to distinguish the cards using the normalised RGB value.

The graph below shows the respective values of the colours in ambient lighting of the drawing offices of CAGB 750, where the calibration of the buggy was performed.

All of the ranges chosen was done after taking into account the fact that the range values for the normalised values do not overlap with different colours.

For future development

While the calibration and threshold values sequence works, the clear values achieved can be unreliable at times. If more time had permitted, we would have stored the values of each colour individually, and made the motor_response to respond to rgb values in those ranges. Furthermore, we would have also tried differentiating colours by turning different colours of the colour clicker on separately, rather than just base all the colour readings on white to more accurately distinguish between the closer values (e.g., pink and white).

In order to avoid repeated calibration before every run, the rangeCalibrate function could be placed outside the main so values stored once and used several times.