CS5245 - Mid-term progress Report – The Magic T-Shirt

Zhiyu's Part

Since the 3D camera is not helpful to our project, we began to try another approach:

1. We paste a check board (see Figure 1) onto the T-shirt. The check board consists of 13*9 squares. There are 4 colors for the squares, and no two neighboring squares share a same color.
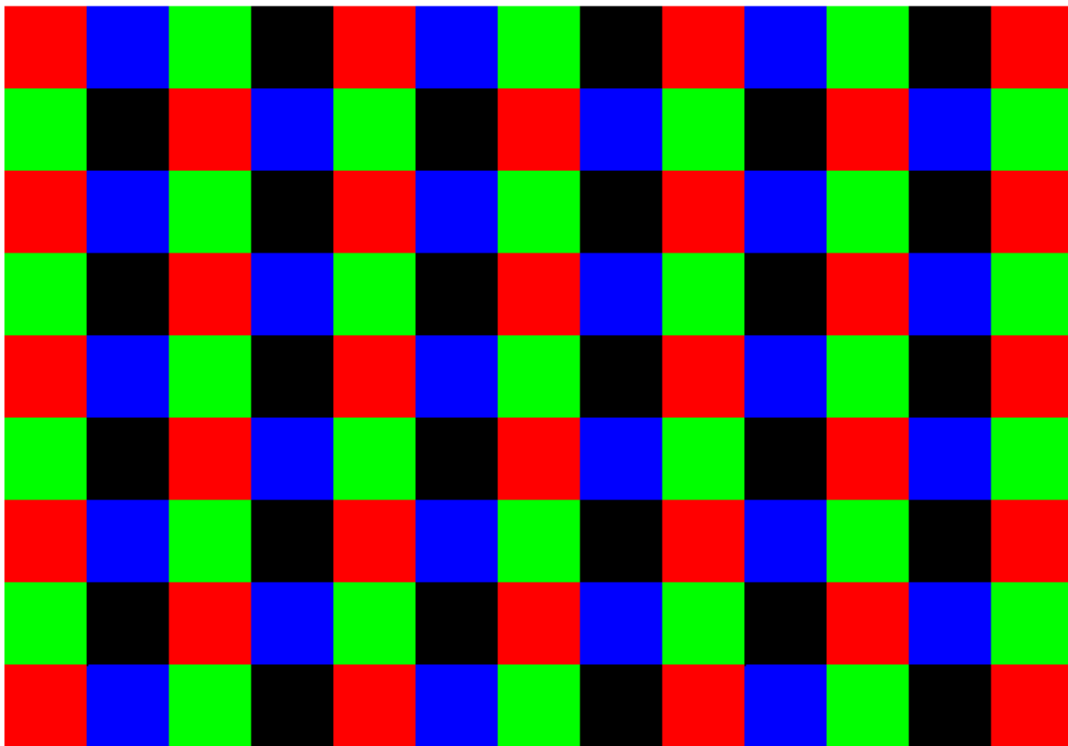

Figure 1

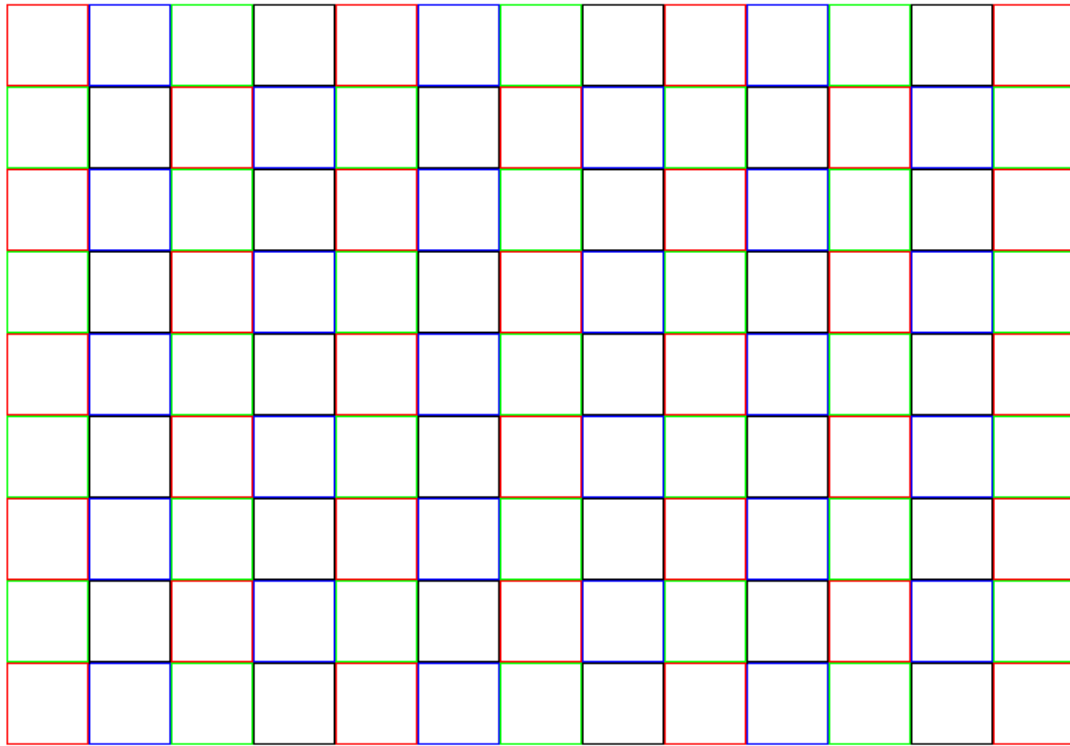2. Then we detect the boundaries of each square (see Figure 2).

Figure 2

3. Later we will do 2D morphing and texture mapping with the help of these boundaries.

Work we've done

- Shooting a testing video clip
- CheckBoard design
- Boundary detection (almost finished)

Cedric's Part

The data zhiyu is going to get from the checkboard will be given as a list of points not related to each other. These points will correspond to the intersection of the squares of the checkboard. But for each intersection, Zhiyu is going to find 4 points (regardless of the boundaries of the checkboard for now), one of each color.

My job will be to find out to which square each point belongs and also to which intersection it corresponds. When i've recovered the 4 points corresponding to an intersection, i'll replace these 4 points by the mean one to get a "continuity" between 2 consecutive squares. The data will be then more usable for Zhang Xin.

Zhang Xin's Part

Derive formulas for image morphing from square cell to convex quadrilateral, using Bezier Patch, as shown in Fig. 1.

Given a convex quadrilateral $(a_{00}, a_{10}, a_{11}, a_{01})$, the parameterization into the unit square cell is:

$$Q(u,v) = u \cdot v \cdot a_{00} + u \cdot (1-v) \cdot a_{01} + (1-u) \cdot v \cdot a_{10} + (1-u) \cdot (1-v) \cdot a_{11} \qquad (*)$$

Where $0 \le u \le 1$ and $0 \le v \le 1$.

Or given $Q(u,v)$, which is a vector of length 2 specifying the pixel coordinates in the frame, we can also compute the (u, v) pair by solving equation (*).
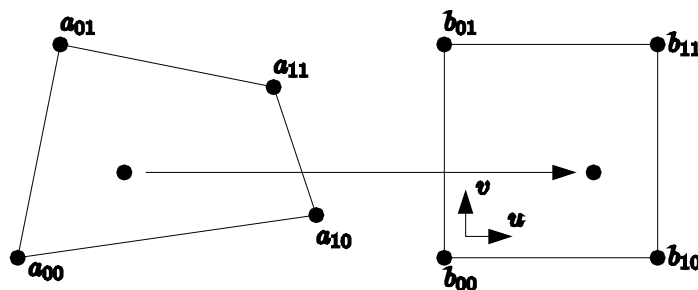

Fig. 1

After Zhiyu computes the cells in the video sequence, each of which is defined by 4 points, I will morph the square cells in the check board onto the T-shirt, hoping it looks good. Right now, we are testing the idea for a check board printed on the paper. Once we finish it, we'll print the check board pattern onto a white T-shirt.

I am writing the code to do this image morphing now. I will test it once I'm given some outputs from Zhiyu.