EECS 442 F14
HW # 5

WU Tongshuang 40782356

December 8, 2014

1 Clustering

Implementation

- Initialize cluster centroids $\mu_1, \mu_2, \mu_3 \in \mathbb{R}^n$ randomly since there are $k = 3$ clusters
- repeat until convergence:

  {

  For every i, set $c^{(i)} := argmin_j ||x^{(i)} - \mu_j||^2$,

  For every j, set $\mu_j := \frac{\sum_{i=1}^{m} 1(c^i=j)x^{(i)}}{\sum_{i=1}^{m} 1(c^i=j)}$

  }

Please refer to the code for the detailed implementation. The result is shown in Figure 1. While the initialization is different, the results look similar.

2 Object Recognition

a,b

The accuracy is around 72%. Please refer to the code for implementation.

(a) initial centroid:
$$\begin{bmatrix} 255 & 255 & 255 \\ 255 & 255 & 255 \\ 233 & 213 & 150 \end{bmatrix}$$

(b) initial centroid:
$$\begin{bmatrix} 255 & 152 & 29 \\ 255 & 255 & 255 \\ 255 & 255 & 255 \end{bmatrix}$$

(c) initial centroid:
$$\begin{bmatrix} 255 & 255 & 255 \\ 250 & 250 & 252 \\ 255 & 255 & 255 \end{bmatrix}$$

(d) initial centroid:
$$\begin{bmatrix} 255 & 255 & 255 \\ 255 & 255 & 255 \\ 255 & 255 & 255 \end{bmatrix}$$

(e) initial centroid:
$$\begin{bmatrix} 143 & 5 & 21 \\ 118 & 132 & 73 \\ 228 & 156 & 48 \end{bmatrix}$$

Figure 1: Images with different distributed ray tracing effects