CS 3510 Homework 5

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Problem 1

(a) (1) Zero iteration:
$\mu_1 = 2$
$\mu_2 = 8.33$

(2) First iteration:
$2 \rightarrow \{1, 2, 3, 4\}$
$8.33 \rightarrow \{6, 9, 9, 10, 12\}$
Calculating new value for centroids:
$\mu_1 = 2.5$
$\mu_2 = 9.2$

(3) Second iteration:
$2.5 \rightarrow \{1, 2, 3, 4\}$
$9.2 \rightarrow \{6, 9, 9, 10, 12\}$

(b) I can conclude that the algorithm has converged because from first to second iteration, the assignment of points to the centroids do not change.

Problem 2

(a) The variance of a partition will decrease because the more cluster we have, the fewer points in which we have to calculate the distance with the centroid, thus having a lower value of variance.

(b) We can set the value k to be n because the distance of each point to its corresponding centroid will be zero.

Problem 3

The reward function does not effectively communicate the goal to the agent because no matter how long the agent stays in the maze, in the end it will still only get total reward of 1.

We can set the reward to be -1 for every time step and enforce a policy to the agent such that it will target the reward value closest to $R = 1$ (escape at the next time step).

Image Segmentation using K-Means

These are three images I generated with $K = 10$:

(a) Before

(b) After

Figure 1: My handsome face

(a) Before

(b) After

Figure 2: Farm

(a) Before

(b) After

Figure 3: My hometown