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Lab 5 Color-Based Image Clustering

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Let's Cluster the Bananas by Ripeness!

STEP 1: Feature Extraction

```
for all input images
   Read an image
   Find a set of banana pixels in an image
   Compute color features                    //create feature vectors
End
```

STEP 2: Banana Ripeness Clustering

STEP 1: Feature Extraction

STEP 1.1: Find a set of banana pixels in an image

An input image has white background. Thus, the saturation values of background pixels should be lower than 0.3, while the saturation values of banana pixels should be higher than 0.3

MATLAB function	Example

`k = find(img)`	`k = find(X)` returns a vector containing the linear indices of each nonzero element in array X.
	• If X is a vector, then find returns a vector with the same orientation as X.
	• If X is a multidimensional array, then find returns a column vector of the linear indices of the result.
	
	Example Find the elements that are less than 10 in X.
	
	`>> X = [11  2  15  9;`
	`5  13  14  7];`
	
	`>> k = find(X < 10)`
	`ans = 2`
	`3`
	`7`
	`8`
	
	`>> X(k)`
	`ans = 5`
	`2`
	`9`
	`7`

STEP 1.2: Compute color features

Compute color features of each banana object by averaging the color values of banana pixels for each color channel (in RGB color space).

MATLAB function	Example

`M = mean(A)`	Returns the mean of the elements of A along the first array dimension whose size does not equal 1.
	• If A is a vector, then mean(A) returns the mean of the elements.
	• If A is a matrix, then mean(A) returns a row vector containing the mean of each column.
	
	Example Find the mean of elements that are less than 10 in X.
	
	`>> M = mean(X(k))`
	`ans = 5`

Output: A Set of Feature Vectors

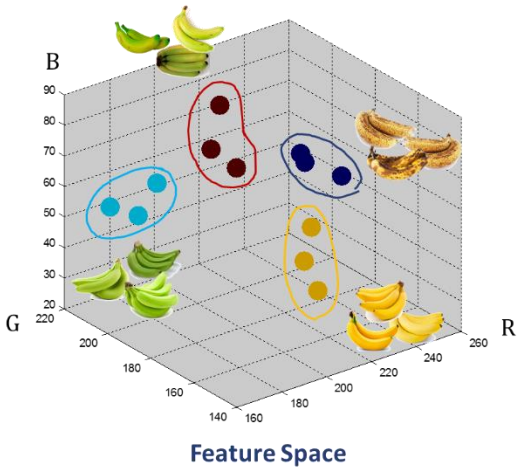
R	G	B
164.19	190.39	61.41
163.16	202.27	59.63
…	…	…
180.14	128.98	58.51

STEP 2: Banana Ripeness Clustering

```
Z = linkage(feature_vector, 'complete', 'euclidean');
c = cluster(Z, 'maxclust', 4);
disp(c);
scatter3(feature_vector(:,1), feature_vector(:,2), feature_vector(:,3),240,c,'fill');
```

Output: A Set of Cluster Labels

Image number	1	2	3	4	5	6	7	8	9	10	11	12
Label	1	1	1	2	2	2	3	3	3	4	4	4



Feature Space


1 1 1 2 2 2


3 3 3 4 4 4