Pipeline

The basic algorithm/processing pipeline for our software application can be clearly seen in the showmethepills script shown below

```
fprintf('-----------------------------------------------\n');
fprintf('[Step 1]: Executing Application\n');

fprintf('[Step 2]: Organizing the reference pill images\n');
orgImgs( 'DR', ref_dir, 'proc' );

fprintf('[Step 2]: Organizing the consumer pill images\n');
orgImgs( 'DC', con_dir, 'proc' );

fprintf('[Step 3]: Processing the reference pill images\n');
procImgs('DR','proc');

fprintf('[Step 3]: Processing the consumer pill images\n');
procImgs('DC','proc');

opts.range = [1 5000];
opts.save_files = true;
opts.href = 1;

fprintf('[Step 4]: Performing pill classification\n');
classify( 'proc', 'DR', 'DC', opts );

fprintf('[Step 5]: Creating MR CSV file\n');
generateMR( 'proc', 'ShowMeThePills' );
```

The specific details of each processing steps 2 through 5 are provided below.

Image Organization

```
%
%   Usage: orgImgs( type, data_dir, proc_dir )
%
%   Description: Organize reference (DC) or consumer (DC) pill images into
%   directory hierachy. At the completion of the script, the processing directory
%   will contain a separate directory that has provided the pill image. Additionally,
%   a Matlab file (DC.mat or DR.mat) will be created that contains a cell, and each
%   element in the cell defines a structure that has a "path" field and an "img" field.
```

```
%   The path field is the fully qualified location of the pill folder (on the file syster
%   and the img field has the full name of the image file (including file extension,
%   such as ".jpg").
%
%   Return: Nothing
%
%   Arguments: 3 required arguments (both strings)
%
%              type = DR or DC (only these two will be accepted, not case
%              sensitive)
%              data_dir = location of the original pill images.
%              proc_dir = location of processing directory on file system
%              (if the directory does not exist, it will be created).
%
%   Example usage:
%
%               orgImgs( 'DC', 'data', 'proc' )
%
%
%
```

Image Processing

```
%
%   Usage: procImgs( type, proc_dir )
%
%   Description: Process reference (DC) or consumer (DC) pill images using
%   directory hierachy created in orgImgs script. At the completion of the
%   script, the files required to compute our three features (shape, text,
%   will be created in the directory for each pill reference or consumer pill.
%
%   Return: Nothing
%
%   Arguments: 2 required arguments (both strings)
%
%              type = DR or DC (only these two will be accepted, not case
%              sensitive)
%              proc_dir = location of processing directory on file system.
%
%   Example usage:
%
%               procImgs( 'DC', 'proc' )
%
%   Note: The following files are created
%       1) mask_bI.jpg (binary mask that has the same resolution as RGB pill image)
```

```
%       2) mask_bW.jpg (square binary mask used to compute shape feature)
%       3) mask_RGB.jpg (square color mask used to compute text feature)
%       4) lcolor.png (square color image used to compute color feature)
%
%
%
```

Classification

```
%
%   Usage: [ S, K, T ] = classify( proc_dir, ref, con )
%
%   Description: Compute the feature matrices for Shape (S),
%   Color (K), and Text (T). At completion of the script
%   the three feature matrices will be stored in the proc_dir
%   with the following names: S.mat, T.mat, and K.mat.
%
%   Arguments (All Strings):
%       (1) proc_dir = location of process directory
%       (2) ref = reference data set. Value can only be DR or DC
%       (3) con = consumer data set. Value can only be DR or DC
%
%   Return:
%       Feature matrices for shape, color and text. For each
%       matrix the number of rows = number of consumer images
%       and the number of columns = number of reference images.
%       ( note: to combine: F = ( S + K + T )/3 )
%
%   Example:
%       [S,K,T] = classify( 'proc', 'DR', 'DC' );
%
%
%
```

MR Generation

```
%
%   Usage: generateMR( proc_dir, file_name )
%
%   Description: Creates the scoring matrix as defined by
%   challenge (http://pir.nlm.nih.gov/challenge/)
%
%   Return: Nothing
%
%   Arguments: 2 required arguments (both strings)
```

```
%               proc_dir = location of processing directory on file system.
%       file_name = name of the CSV file.
%
%   Example usage:
%
%               generateMR( 'proc', 'showmethepills_MR.csv' )
%
%
```