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% ===== %
% This program will run in MATLAB and make a movie out of the image sequences
% identified or stored in a Folder. The image sequences should be in a .tif
% format file. The final image will be converted to .jpg files to make the
% movie in .avi format.
%
% ===== %
% Test the figure files whether it has only one color channel or not
% Conditions of running the program is as follows
% 1. Please make sure you have all images in a particular folder
% 2. Images should be in .tif format, no other formats are supported by this
% codes.
% 3. The program is tested in Linux Mint 19.3, Mac OS 10.15, Windows 10 and MAT
% (academic version), MATLABR2019a. Other OS should be tested before the run.
%
% ===== %
clear all;
close all;
clc;

% Specify the folder where the files live.
myFolder = uigetdir('C:\'); %open the desired folder to run the code
myFolder = '/home/jyoda68/Desktop/MATLABtest/';
% Check to make sure that folder actually exists. Warn user if it doesn't.
if ~isdir(myFolder)
    errorMessage = sprintf('Error: The following folder does not exist: %s', myFolder);
    uiwait(warndlg(errorMessage));
    return;
end
% Get a list of all files in the folder with the desired file name pattern.

filePattern = fullfile(myFolder, '*.tif'); % Change to whatever pattern you need

% read the files from the directory
theFiles = dir(filePattern);

% Making a new directory and transfer the modified images to that directory.
% Go to the directory of operation
cd(myFolder);

% mkdir ../MATLABtest mod_images;
% specify the directory where to save the files
mod_images = fullfile(myFolder, 'mod_images');
% make a new directory to save the modified image files
mkdir(mod_images);

% Run the loop to copy all files for the modifications
for d = 1 : length(theFiles)
    baseFileName = theFiles(d).name;
    fullFileName = fullfile(myFolder, baseFileName);
    [~, filename, ext] = fileparts(fullFileName);
    newFileName = sprintf('%s %s', filename, ext);
    fprintf(1, 'Now reading %s\n', fullFileName);

% Now do whatever you want with this file name,
% such as reading it in as an image array with imread()
% Modify the images in the array and put the boundaries
imageArray = imread(fullFileName);
fd = im2double(imageArray);
fdg = rgb2gray(fd);
Iadj = imadjust(fdg);
bw = imbinarize(Iadj);
bw = bwareaopen(bw, 70);
p = bwperim(bw);

[B,L] = bwboundaries(bw);

jd = figure;
imshow(label2rgb(L, [0 0 1], [.1 .1 .1]));
hold on

for k = 1:length(B)
    boundary = B(k);
    plot(boundary(:,2), boundary(:,1), 'r', 'LineWidth', 2)
end

imshow(imageArray); % Display image.
drawnow; % Force display to update immediately.
% save the images after the modifications in the new directory
saveas(jd, fullfile('mod_images', newFileName));
end

% ===== %
% Making a new directory and transfer the modified images to that directory.
% myfolder = '/home/jyoda68/Desktop/MATLABtest/mod_images/';
% read the files from the modified folder
myfolder = fullfile(myFolder, 'mod_images');
inputfilepath = fullfile(myfolder, '*.tif');
tiff_files = dir(inputfilepath);

% Go to the folder
cd(myfolder);
mkdir ../mod_images jpg;
% OutputFolder = fullfile('/home/jyoda68/Desktop/MATLABtest/mod_images/jpg/');
% create the output folder to save the modified files
OutputFolder = fullfile(myfolder, 'jpg');

% Run the loop to save all images
for n = 1:length(tiff_files)
    baseFile = tiff_files(n).name;
    fullFileNameInput = fullfile(myfolder, baseFile);
    rgbImage = imread(fullFileNameInput);
    fullFileNameOutput = fullfile(OutputFolder, baseFile);
    fullFileNameOutput = strrep(fullFileNameOutput, '.tif', '.jpg');
    imwrite(rgbImage, fullFileNameOutput);
end

% ===== %
% ImageFolder = ('/home/jyoda68/Desktop/MATLABtest/mod_images/jpg/');
% Open image folder to crop the files in specific dimensions
ImageFolder = fullfile(myfolder, 'jpg');
filePattern = fullfile(ImageFolder, '*.jpg');
jpegFiles = dir(filePattern);

% cd(ImageFolder);
for k = 1:length(jpegFiles)
    baseFileName = jpegFiles(k).name;
    fullFileName = fullfile(ImageFolder, baseFileName);
    fprintf(1, 'Now reading %s\n', fullFileName);
    imageArray = imread(fullFileName);
    imshow(imageArray); % Display Image.
    drawnow; % Force display to update immediately.
    % Get initial size
    [rows, columns, numberOfColorChannels] = size(imageArray);
    % Get size reduction / magnification factor
    %sizeFactor = 800 / columns;
    % Resize
    %newImage = imresize(imageArray, sizeFactor);
    % Get the new size.
    [rows, columns, numberOfColorChannels] = size(imageArray);
    % Crop if necessary
    if rows > 200
        % Take upper 600 lines. You could take lower or middle 600 also.
        newImage = imcrop(imageArray, [145 45 1400 1080]);
        newFileName = strrep(fullFileName, '.jpg', '_resized.jpg');
        imwrite(newImage, newFileName);
    end
end

% ===== %
% ImageFolder = ('/home/jyoda68/Desktop/MATLABtest/mod_images/jpg/');
% Make the movie
filePattern = fullfile(ImageFolder, '*_resized.jpg');

jpgFiles = dir(filePattern);

% Write the video in uncompressed file
writerObj = VideoWriter('newMovie.avi', 'Uncompressed AVI');
% trying to set up the movie quality, default video quality 75
writerObj.Quality = 80;
% write the desired frame rate, frames per second
writerObj.FrameRate = 5;

% open the video file to write
open(writerObj);

% read the files and make the movie
for frameNumber = 1 : length(jpgFiles)
    baseFileName = jpgFiles(frameNumber).name;
    fullFileName = fullfile(ImageFolder, baseFileName);
    fprintf(1, 'Now reading %s\n', fullFileName);
    thisImage = imread(fullFileName);
    imshow(thisImage);
drawnow;
% write the video file
writeVideo(writerObj, thisImage);
end

% close the video file to end the programs
close(writerObj);

% ===== %
% Conclude the program
% remove the temporary folders and files
% move the video file to the parent folder
movefile *.avi ../;

% remove the temporary directory
rmmdir jpg s;

% go to the parent directory
cd ../;

% remove the other temporary directory
rmmdir mod_images s;

% clear all the workspace and files
clear all;
close all;
clc;

% exit from the program and from the MATLAB
quit;
quit;
```