matPTV

This is a particle tracking library for MATLAB. The code is based on a collection of algorithms developed by David Grier, John C. Crocker, Eric Weeks, Eric Dufresnes. See the original algorithms here: <http://site.physics.georgetown.edu/matlab/code.html>

## Usage:

This library is designed to track the motion of fluorescent micro-spheres. It works best when particles are brightly lit on a dark background, and well separated (by at least 1 particle width).

**Example Code:**

%% Load Image Data

DIR = ‘./YOUR IMAGE DIR’

flist = dir(fullfile(DIR,’\*.tif’)); %list all TIFF images in DIR

nF = numel(flist); %number of pictures in DIR

info = imfinfo(fullfile(DIR,flist(1).name)); %get image size for prealloc

%preallocate memory for images

imstack = zeros(info.Height,info.Width,nF);

%Load Images

for f=1:nF

imstack(:,:,f) = mat2gray(imread(fullfile(DIR,flist(f).name)));

end

%% Find Particle Locations

bpass\_lnoise = 1; %approximate size of image noise (in pixels)

bpass\_sz = 9; %approximate particle size in pixels

pkfnd\_sz = 9; %size of region around particle center (~bpass\_sz) [optional]

pkfnd\_th = .001; %minimum threshold for local maxima [optional]

cnt\_sz = 9; %approx particle size

cnt = cell(nF,1); %cell array to hold centroid locations in each frame

for f=1:nF

%apply a bandpass filter to enhance particles

B=bpass(imstack(:,:,f), bpass\_lnoise,bpass\_sz);

%find local maxima

PKS = pkfnd(B); %use mean image intensity as threshold, no size limit

%PKS = pkfnd(B,pkfnd\_th,pkfnd\_sz); %use threshold & size

%find sub-pixel centroid location

cnt{f} = cntrd2(B,PKS,cnt\_sz); %original method by Greir et al.

%cnt{f} = cntrd2(B,PKS,cnt\_sz); %more accurate, slower (by R.Parthasarthy)

end

%concatinate results into a form usable by trackPTV()

nrows = 0;

for f=1:nF

nrows = nrows + size(cnt{f},1);

end

cnts = NaN(nrows,3);

r=1;

for f=1:nF

nr = size(cnt{f},1);

cnts(r:r+nr-1,1:2) = cnt{f}(:,1:2);

cnts(r:r+nr-1,3) = f;

r=r+nr;

end

%delete any missing rows

cnts(isnan(cnts(:,1)),:) = [];

%% Track Particles

% Link particle locations into tracks

maxdsp = 3; %maximum centroid displacement in pixels

param.mem = 4; %number of frames to remember a centroid if it gets lost

param.dim = 2; %number of cols to pad output with

param.good = 0.8\*nF; %minimum number of frames a track must have data for

param.quiet = true; %don’t talk to us

tracks = track2array(trackPTV(cnts,maxdsp,param)); %calc tracks

[nF,~,nID] = size(tracks); %tracks(:,:,:) = <nF x 2 x nID>