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%Import MetaChecker and ColorChecker values to 81x25 matrices
colorChecker = importdata('ColorChecker_380-780-5nm.txt');
metaChecker = importdata('MetaChecker_380-780-5nm.txt');

%Import CIE data into struct
cie = loadCIEData();

%Calculate XYZ values of samples under A and D65 light sources with
    2deg
%std observer
colorCheckerD65XYZs = ref2XYZ(colorChecker, cie.cmf2deg, cie.illD65);
colorCheckerAXYZs = ref2XYZ(colorChecker, cie.cmf2deg, cie.illA);
metaCheckerD65XYZs = ref2XYZ(metaChecker, cie.cmf2deg, cie.illD65);
metaCheckerAXYZs = ref2XYZ(metaChecker, cie.cmf2deg, cie.illA);

%Supply XYZ values for A and D65 light sources using 2deg std observer
XYZn_D65 = ref2XYZ(cie.illE, cie.cmf2deg, cie.illD65);
XYZn_A = ref2XYZ(cie.illE, cie.cmf2deg, cie.illA);

%Calculate LAB values for color and meta checkers under D65 and A
    light
colorCheckerD65LABs = XYZ2Lab(colorCheckerD65XYZs, XYZn_D65);
colorCheckerALABs = XYZ2Lab(colorCheckerAXYZs, XYZn_A);
metaCheckerD65LABs = XYZ2Lab(metaCheckerD65XYZs, XYZn_D65);
metaCheckerALABs = XYZ2Lab(metaCheckerAXYZs, XYZn_A);

%Calculate DeltaEab values for samples under A and D65
deltaALab = deltaEab(colorCheckerALABs, metaCheckerALABs);
deltaD65Lab = deltaEab(colorCheckerD65LABs, metaCheckerD65LABs);

%Generate result string to print
res = [ 1:1:24; deltaD65Lab(2:25); deltaALab(2:25)];

%Print Column Matrices in formatted table
fprintf('Patch #\tDELab D65\tDEab illA\n')
fprintf(1, [repmat('%d\t    %2.4d\t    %2.3f\n', 1, 25) '\n'], res);

%Calc XYZ values of real, imaged, and matching patches
patchXYZs = calcColorMunkiXYZs();
XYZn_D50 = ref2XYZ(cie.illE, cie.cmf2deg, cie.illD50);

patchLABs = XYZ2Lab(patchXYZs, XYZn_D50);

%Compare LAB values of real, imaged, and matching patches
real161imaged = deltaEab(patchLABs(:,1), patchLABs(:,2));
real161matching = deltaEab(patchLABs(:,1), patchLABs(:,3));
real162imaged = deltaEab(patchLABs(:,4), patchLABs(:,5));
real162matching = deltaEab(patchLABs(:,4), patchLABs(:,6));

%Create a new canvas with appropriate scale
clf;
hold on

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plot(patchLABs(2,1), patchLABs(3,1), 'r.', 'MarkerSize',25);
plot(patchLABs(2,2), patchLABs(3,2), 'r.', 'MarkerSize',25);
plot(patchLABs(2,3), patchLABs(3,3), 'r.', 'MarkerSize',25);

plot(patchLABs(2,4), patchLABs(3,4), 'b.', 'MarkerSize',25);
plot(patchLABs(2,5), patchLABs(3,5), 'b.', 'MarkerSize',25);
plot(patchLABs(2,6), patchLABs(3,6), 'b.', 'MarkerSize',25);

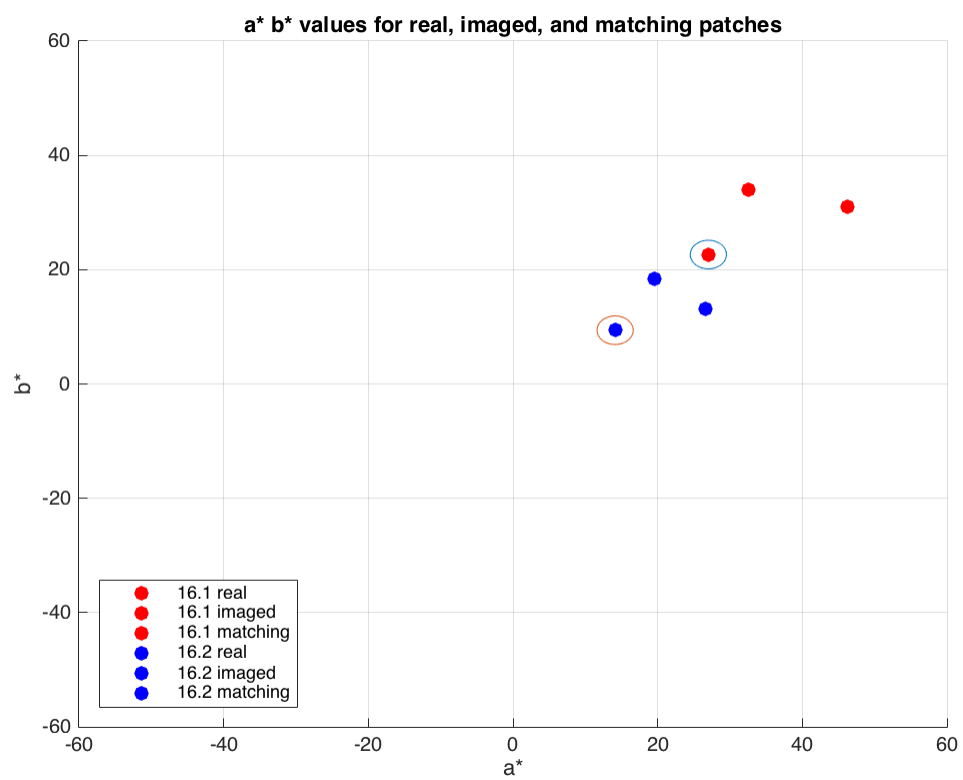
axis([-60,60,-60,60]);
title('a* b* values for real, imaged, and matching patches');
legend('16.1 real', '16.1 imaged', '16.1 matching',...
       '16.2 real', '16.2 imaged', '16.2 matching', 'Location', 'southwest');
xlabel('a*');
ylabel('b*');
grid on;

%Draw circles of 2.5 radius over real a* and b* vals of both patches
circle(patchLABs(2,1), patchLABs(3,1), 2.5);
circle(patchLABs(2,4), patchLABs(3,4), 2.5);

hold off;

Patch # DELab D65 DEab illA
1      2.5974e-07    22.636
2      1.1361e-07    22.178
3      1.0559e-07    32.275
4      1.9045e-07    28.232
5      3.9798e-07    25.937
6      1.3263e-07    29.487
7      8.5812e-08    17.309
8      1.4537e-07    27.241
9      1.6652e-07    12.210
10     2.9074e-07    19.509
11     1.5608e-07    22.623
12     1.3047e-07    16.970
13     1.0833e-07    20.083
14     1.1933e-07    26.099
15     6.7078e-08    7.053
16     1.3297e-07    11.532
17     6.4681e-09    10.690
18     8.5813e-08    31.619
19     2.6606e-07    2.545
20     6.9477e-08    15.940
21     1.8463e-07    28.926
22     8.3373e-08    26.751
23     3.6676e-07    20.574
24     1.0221e-07    18.567

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