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% Ivan Orlovic and Shane Rodricks
clear;
A = imread('442.jpg');
figure;
subplot(2,2,1);
imshow(A);
title('Original Image');
% HSV for color segmentation
hsvImage = rgb2hsv(A);
% take out green background
greenHueMin = 0.25;  % Start green
greenHueMax = 0.40;  % End green
saturationMin = 0.2; % Minimum saturation to exclude unsaturated areas
valueMin = 0.2;      % Minimum brightness to avoid very dark areas
% Create masks HSV
hueMask = (hsvImage(:,:,1) < greenHueMin) | (hsvImage(:,:,1) > greenHueMax); % help on this
saturationMask = hsvImage(:,:,2) > saturationMin;
valueMask = hsvImage(:,:,3) > valueMin;
% exclude green colors
notGreenMask = hueMask & saturationMask & valueMask;
% Apply the mask
noGreenImage = A;
noGreenImage(repmat(~notGreenMask, [1, 1, 3])) = 0;
subplot(2,2,2);
imshow(noGreenImage);
title('No Green Background Image');
grayImage = rgb2gray(noGreenImage);
% Otsu threshold
threshold = graythresh(grayImage);
binaryMask = imbinarize(grayImage, threshold);
% Clean up the mask using morphological operations... this helped identify
% players
binaryMask = imopen(binaryMask, strel('disk', 5));
binaryMask = imclose(binaryMask, strel('disk', 10));
% Detect centroids for players
stats = regionprops(binaryMask, 'Centroid');
if isempty(stats)
   disp('No players detected. Please check the segmentation parameters and the binary image.');
else
   centroids = cat(1, stats.Centroid);
   subplot(2,2,3);
   imshow(noGreenImage);
   hold on;
   plot(centroids(:,1), centroids(:,2), 'b*');
   title('Marked Image');
   % Count players
   numPlayers = size(centroids, 1);
   disp(['Number of players detected: ', num2str(numPlayers)]);
   if numPlayers < 11
       missingPlayers = 11 - numPlayers;
       disp([num2str(missingPlayers), ' players missing due to red cards.']);
   end
   % Divide the field
   fieldWidth = size(A, 2);
   fieldHeight = size(A, 1);
   sectionWidth = fieldWidth / 4;
   playersPerSection = zeros(4,1);
   for i = 1:size(centroids, 1)
       sectionIndex = min(floor(centroids(i,1) / sectionWidth) + 1, 4);
       playersPerSection(sectionIndex) = playersPerSection(sectionIndex) + 1;
   end
   subplot(2,2,4);
   imshow(noGreenImage);
   hold on;
   for i = 1:3
       line([i * sectionWidth, i * sectionWidth], [0, fieldHeight], 'Color', 'w', 'LineWidth', 2);
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    end
    plot(centroids(:,1), centroids(:,2), 'b*');
    for i = 1:4
        text((i-0.5)*sectionWidth, fieldHeight * 0.95, num2str(playersPerSection(i)), 'Color', 'y',
'HorizontalAlignment', 'center');
    end
    title('Divided and Marked Image');
    % Print formation
    formationString = sprintf('%d-%d-%d-%d', playersPerSection);
    disp(['Detected Formation: ', formationString]);
end
```