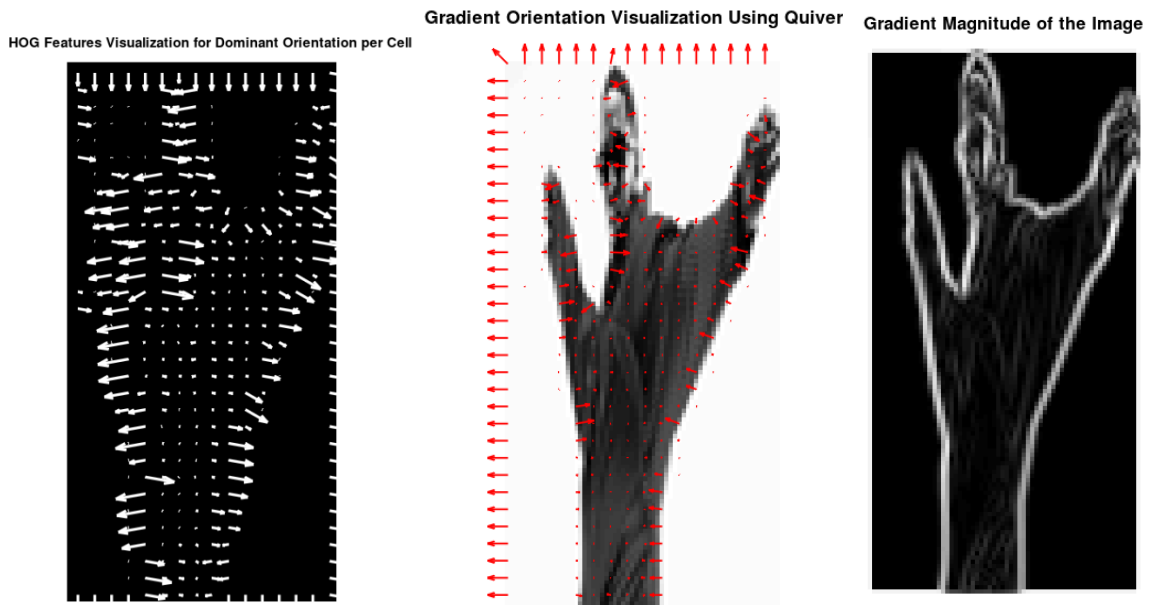


HOG Report

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Part 1: HOG Feature Extraction on Personal Image



gamma-normalized image



Observations

The gamma-normalized image has a more evenly distributed illumination, it highlights the details without shadows or harsh contrasts. Gradient magnitude emphasizes edges and transitions in intensity, primarily around prominent features like the eyes and mouth. The plot for the gradient orientation provides an insight on the edge directions and their density, this correlates to key facial contours. The HOG features visualization

captures the dominant edge orientations within cells, this provides a clear representation of the facial structure.

Part 2: Experimenting with HOG Parameters

Cell Size: 8x8, Block Size: 2x2

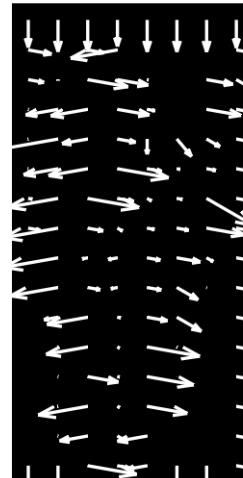
Gradient Magnitude of the Image



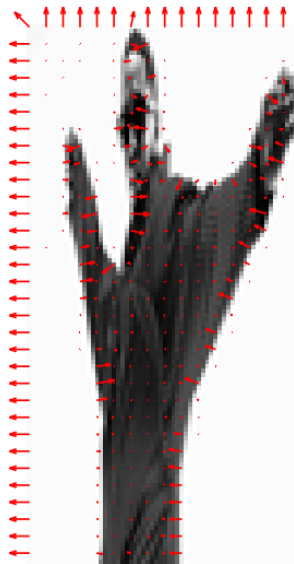
Gamma-normalized Image



HOG Features Visualization for Dominant Orientation per Cell



Gradient Orientation Visualization Using Quiver

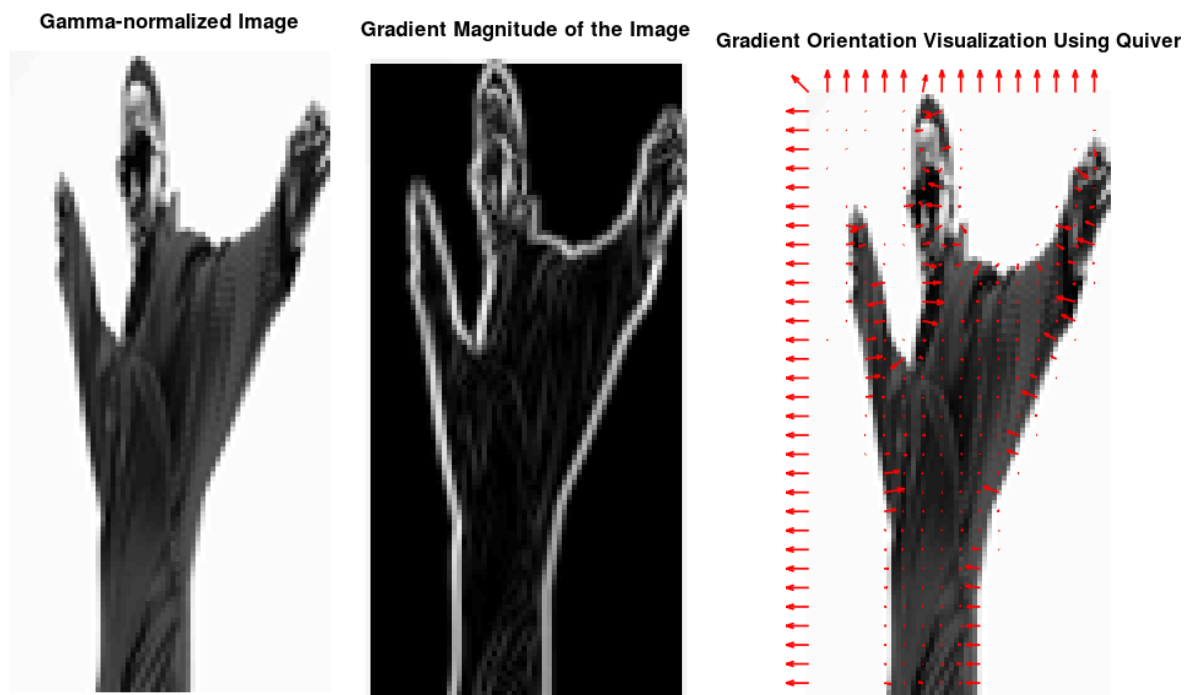


Reflections

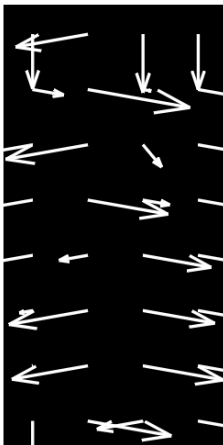
Cell Size: 8x8, Block Size: 2x2

The smaller cell size captures the lighter details, this leads to more localized gradients.

The features are denser, with a high level of detail, this makes the configuration ideal for objects with highly detailed textures or small patterns.



HOG Features Visualization for Dominant Orientation per Cell



Reflections

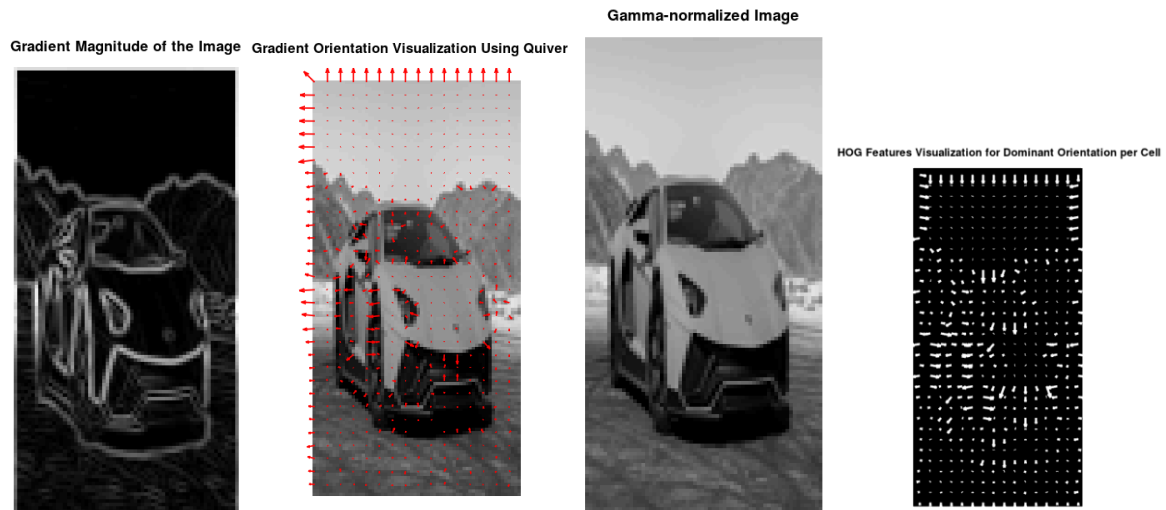
Cell Size: 16x16, Block Size: 2x2

The larger cells generalize details, making it to result into a coarser representation. This reduces computational cost, but can lose critical information for smaller and detailed features.

Most Distinguishable Features

The 8x8 cell size with a 2x2 block size provides the most visually distinguishable features, as it balances detail and noise well.

Part 3: HOG Feature Extraction on a Car/Truck Image



Reflection: Comparing HOG Features

1. Differences Between Face and Car/Truck Image

- **Face Image:** The HOG features for the face highlight smooth transitions and rounded edges, primarily capturing contours of the eyes, nose, and mouth.
- **Car/Truck Image:** The HOG features for the car/truck emphasize sharp edges, corners, and straight lines, such as the vehicle's chassis, wheels, and windows.

2. Insights

HOG effectively captures structural differences between organic shapes (faces) and mechanical ones (vehicles). The dominant orientations differ significantly, showcasing HOG's utility in object classification.