Context-Free

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# Requirements

* **Primary goal**: to minimize the likelihood of pedestrian and driver casualties due to inaccuracies and inefficiencies in sign, crosswalk, and pedestrian detection algorithms.
* **Secondary goals, objectives, and tasks**:
  1. **Goal**: stop sign detection. Detect stop signs in real-time with sufficient efficiency to allow for stopping time. Test SURF against two alternate algorihtms, described below.
     1. **Objective**: construct and R-channel integral-image-based detector.
        1. **Task**: compute integral image on the R-channel of the image.
        2. **Task**: superimpose an*m*x*m*grid on the image and compute the sums of the R-channel intensity per 2x2 region.
        3. **Task**: for the 2x2 region with the maximum sum, recursively apply (ii) until the region with the maximum R-channel intensity density is obtained.
        4. **Task**: in the neighboorhoods of the vertices inside the maximum-density region, find the four box such that the diagonal along those boxes separates a maximum-density R-channel triangle from a minimum-density R-channel triangle.
        5. **Task**: obtain the 8 vertices of the sign from the above.
     2. **Objective**: construct octagon detector.
        + **Task**: apply a shape detector to yield sets of vertices.
        + **Task**: discard all sets where *n*6= 8.
        + **Task**: check to see if the opposing edges of the 8-vertex shape are parallel (within a certain threshold).
  2. **Goal**: pedestrian crosswalk sign detection.
     1. **Objective**: construct and RG-channel integral-image-based detector.
        1. **Task**: compute integral image on the R-channel of the image.
        2. **Task**: superimpose an*m*x*m*grid on the image and compute the sums of the R-channel intensity per 2x2 region.
        3. **Task**: for the 2x2 region with the maximum sum, recursively apply (ii) until the region with the maximum R-channel intensity density is obtained.
        4. **Task**: in the neighboorhoods of the vertices inside the maximum-density region, find the two boxes such that the diagonal along those boxes seperates a maximum-density RG-channel triangle from a minimum-density RG-channel triangle.
        5. **Task**: obtain the 3 vertices of the sign from the above.

# Design

• **Modules**

1. **SignDetector1**:

* **Functionalities**: computes and uses integral image on the R-channel to find maxmiumdensity areas used to approximate the region occupied by the stop sign.
* **Data structures**:

∗ **Namespaces**: EmguCV.CV.

∗ **Classes** (Image) and **class members**: Resize(), Convert(),

1. **SignDetector2**:
   * **Functionalities**: uses edge detection, then isolates eight vertices with maximum octagonality.
   * **Data structures**: Image, LineSegment2D, boxList, triangleList, Contour ∗ **Namespaces**: EmguCV.CV.

∗ **Classes** (Image, Contour) and **class members**: Canny(), HoughLinesBinary(), Resize(), Convert(), PyrUp(), PyrDown(), FindContours().

1. **PedDetector**:
   * **Functionalities**: detects pedestrians using built-in EmguCV classes.
   * **Data structures**: Rectangle[].

∗ **Namespaces**: EmguCV.CV.

∗ **Classes** (Image, HOGDescriptor) and **class members**: Draw(), SetSVMDetector(), DetectMultiScale(), GetDefaultPeopleDetector().

# Implementation Plan and Timeline

• **Mod**

# User Interface

• **Mod**

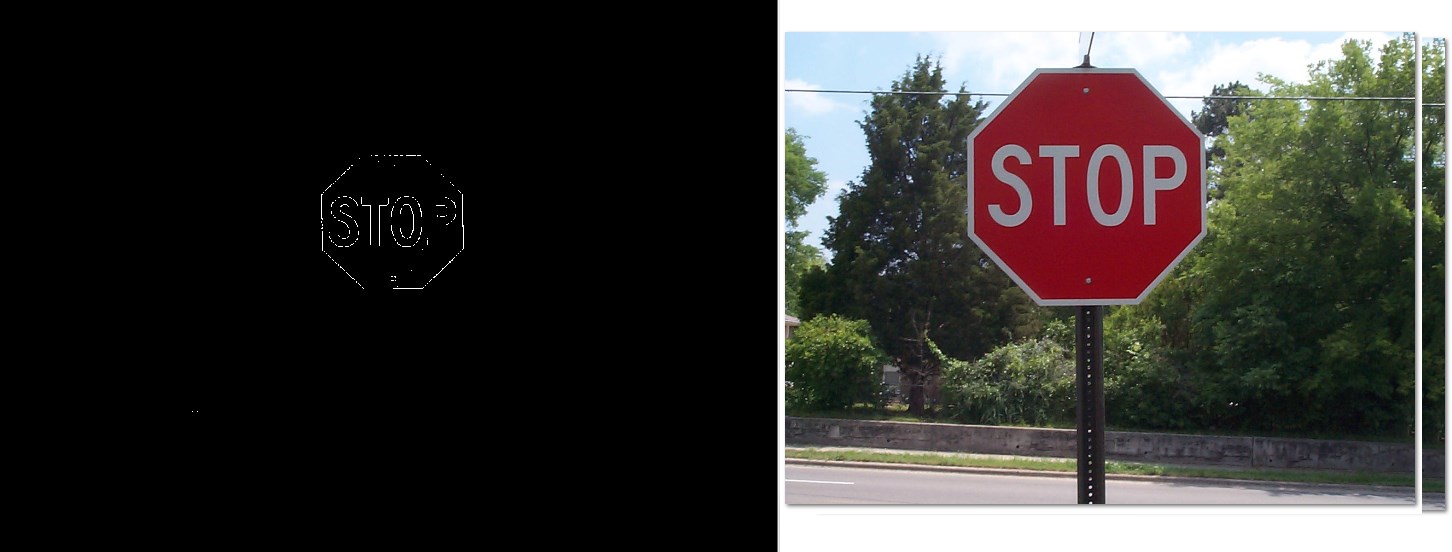


Figure 1: Edge detector by computing R-(G+B), clamped from 0 to 255



Figure 2: Edge detector by computing R-(G+B), clamped from 0 to 255