

## **Current Implementation**

The system for identifying 'STOP' signs is designed with a structured approach, composed of several specialized modules, each dedicated to a particular phase of the detection process. First, the system utilizes the HSV color model to accurately identify red tones within the image, a fundamental characteristic of 'STOP' signs. This identification is refined by employing two distinct ranges of red, allowing for a broad spectrum of the color to be recognized, thereby accommodating its variability in different lighting conditions. Following this, the system employs advanced techniques in contour analysis and shape approximation to detect the unique octagonal form associated with 'STOP' signs. This step incorporates precise criteria for evaluating the size and shape to ensure the detected object closely resembles a 'STOP' sign. The final stage involves the application of EasyOCR, an optical character recognition tool, which scrutinizes the image for the word "STOP." The detection of this text serves as the conclusive indicator of the sign's presence, thereby completing the identification process with a high degree of reliability.

## **Limitations**

Despite its structured approach, the system faces several limitations. The detection of red color is particularly sensitive to lighting variations, potentially affecting accuracy. Shape detection also presents challenges, as the strict criteria for identifying octagons may result in missed detections or false positives. Furthermore, OCR's reliability can be compromised by factors such as font variability, sign orientation, and partial obstructions. General system performance is likewise influenced by external conditions such as weather, environmental obstructions, and the quality of the image itself.

## **Future Improvements**

To enhance the system's efficacy, several improvements are proposed. For color detection, adopting adaptive thresholding or integrating machine learning models could offer more robust red color identification. Shape detection could benefit from advanced techniques like deep learning, employing convolutional neural networks for greater precision. Optimizing OCR might involve refining image pre-processing steps, custom training on a wider array of fonts, or adopting more sophisticated OCR technologies. Broadening the system's testing across diverse datasets and ensuring adaptability to various environmental conditions are also recommended. Additionally, incorporating data from other sensor types, such as LIDAR or radar, could significantly augment detection capabilities.