The output from MATLAB simulation will be used to:

- The query image is down-sampled and converted into grayscale on MATLAB.
- The image is blurred using Gaussian scale and octaves are generated for different varying scales.
- The difference of Gaussian-blurred images are taken.
- The peak values are detected to facilitate keypoint generation.
- The generated keypoints are refined by eliminating low-contrast and edge keypoints.
- The high quality are retained and are termed as Feature descriptors which are used for object recognition with the help of feature matching.

**MATLAB Simulation Results**

This section includes the results obtained by the implementation of SIFT algorithm using MATLAB.

- **Query Image**
- **Descriptors on the query image**
- **Keypoints on the query image**
- **Feature matching between two images**

**SCALE SPACE EXTREMA DETECTION**

- The above figure shows the design flow of the proposed work.
- Scale space extrema detection can be further divided into 3 steps, namely Gaussian pyramid, Difference of Gaussian (DoG) Pyramid and Extrema Detection.

MATLAB implementation of SIFT, processing time for software implementation. Gaussian generation for varying Scale value, and FIFO reading of pixel values.

- The image is blurred using Gaussian scale and octaves are generated for different varying scales.
- The pixel is considered as a Keypoint if it is a minima or maxima with respect to its 26 neighbors.

**PROJECT FLOW**

- MATLAB is used to simulate the Scale Space Detection Operation.
- The output from MATLAB simulation will be used to compare with RTL and gate-level simulations
- Speed, Area, and power are performance metrics.

- The above figure shows Grayscale image. Image preprocessing is done using MATLAB.
- The original image is resized to a 256x256 image.
- Normalized image is converted to a .bitfile for input to the Verilog models

**ASIC: Adoption for Specific Functional Safety Standards**

- The Scale-Invariant Feature Transform (SIFT): A detection algorithm that detects and describes local features in images.
- The Hybrid CNN-SIFT: Combines the steps of CNN and SIFT
- Computationally expensive operations of SIFT can be accelerated by hardware such as an ASIC.

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**Key References**


**PROJECT STATUS**

- Work completed:
  - MATLAB implementation of SIFT, processing time for software implementation. Gaussian generation for varying Scale value, and FIFO reading of pixel values.
  - Convolution of pixel value with gaussian constant and Extrema detection using Verilog