**Course Name: Computer Vision**

**Course Code: 19AI621**

**Course Advisor: Dr. Senthilkumar T**

**Title: Lane Detection for Autonomous Vehicles using Computer Vision Algorithm**

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**Spatial Domain Operations on Case Study Image**

**Original Image:**

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**Image Smoothing**

#### **Average Filter**



#### **Weighted Average Filter**

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#### **Gaussian Blurring**



#### **Median Filter**

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#### **Image Sharpening**



#### **Roberts Filter**

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#### **Sobel Filter**

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#### **Gamma Transform**

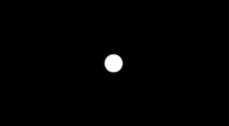


#### **Log Transform**

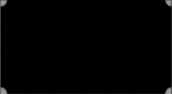


**Frequency Domain:**

* **Image After Applying Noise:**
* **Low Pass Filter:**

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* **Decentralized Image:**

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* **Processed Image:**

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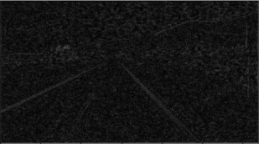
* **High Pass Filter:**

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* **Decentralize:**

****

* **Processed Image:**

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* **Ideal Low Pass Filter**



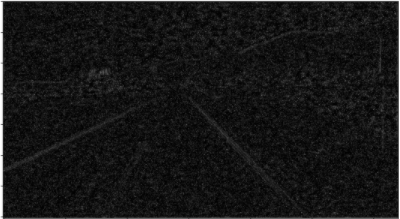
* **Butterworth Low Pass Filter:**

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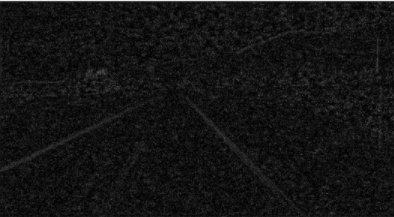
* **Gaussian Low Pass Filter**

****

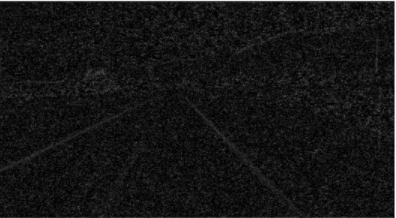
* **Ideal High pass Filter**

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* **Butterworth High Pass Filter:**

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* **Gaussian High Pass Filter**

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**Observation after Comparison Between Spatial and Frequency Domain Filters:**

**Spatial Domain:**

**Input -> Image Processing -> Output**

**Frequency Domain:**

**Frequency + Distribution -> Image Processing -> Inverse Transformation -> Output**

* Spatial domain deals with image plane itself whereas Frequency domain deals with the rate of pixel change.
* Spatial domain works based on direct manipulation of pixels whereas Frequency domain works based on modifying fourier transform.
* Spatial domain takes less time to computer whereas Frequency domain takes more time to compute.

**Feature Extraction**

* **Harris Corner Detection:**

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* **SIFT** (**Scale-Invariant Feature Transform):**

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* **SURF (Speeded-Up Robust Features)**
* **Multiscale Oriented Patches Descriptor (MOPS)**

#### **Translation** **(T = MT1)**



#### **Rotation** **(T = MRMT1)**

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#### **Affine Transformation**

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#### **Perspective Transformation**

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#### **Scaling**

