CV hw3

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Q1.1

1.$\frac{\delta W(x;p}{\delta p^T}$ is the jacobian of the image evaluated at (x;p)

2.$A = \nabla I \frac{\delta W}{\delta p}$, b=$T(x) - I(W(x,p))$

3.$A^T A$ needs to be full rank

Q1.3

Frame 1

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Frame 100

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Frame 200

:

Frame 300

:

Frame 400

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Q1.4

Frame 1

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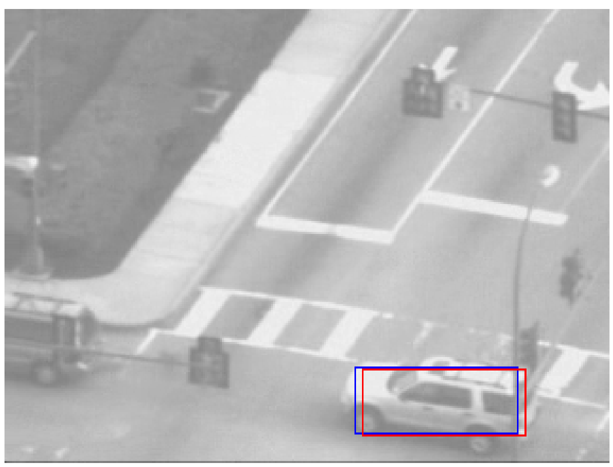

Frame 100

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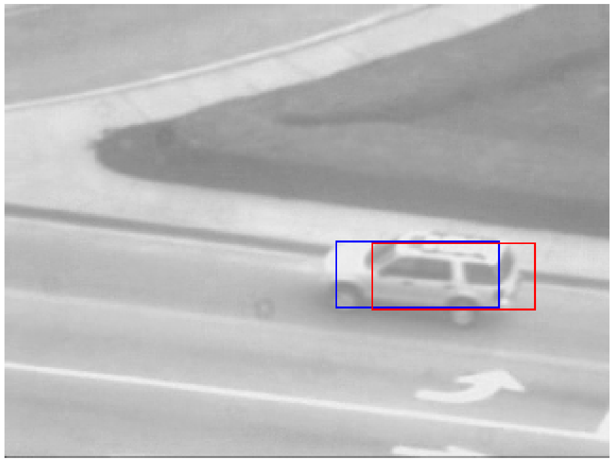

Frame 200

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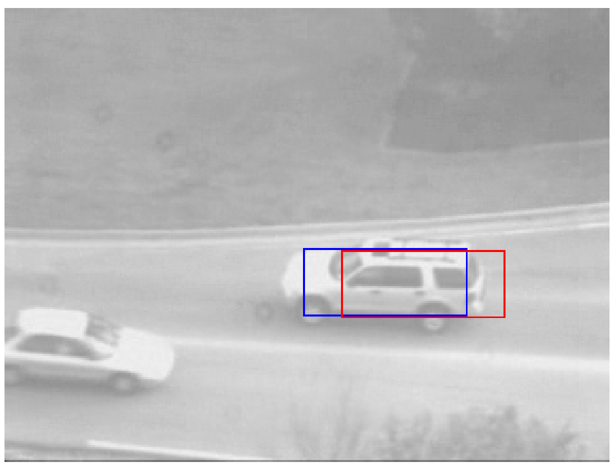

Frame 300

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Frame 400

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Q2.1

We are given the following equation

$$I_{t+1}(x) = I_t(x) + \sum_{k=1}^{k} \omega_k B_k$$

$$=> I_{t+1}(x) - I_t(x) = \sum_{k=1}^{k} \omega_k B_k$$

For every $\omega i where i = 1, 2, ..., K, we multiply B_i to both side of equation:$

$$B_i * (I_{t+1}(x) - I_t(x) = B_i * \sum_{k=1}^{k} \omega_k B_k(x)$$

Since the bases are orthogonal to each other, $B_i * B_k = 0$ for all i:

$$B_i(I_{t+1}(x) - I_t(x)) = \omega_i * ||B_i(x)||^2$$

$$=> \omega i = \frac{B_i(I_{t+1} - I_t(x)}{||B_i(x)||^2}, \forall i = 1, 2, ..., K$$

Q2.3

Frame 1

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Frame 100

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Frame 200

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Frame 300

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Frame 400

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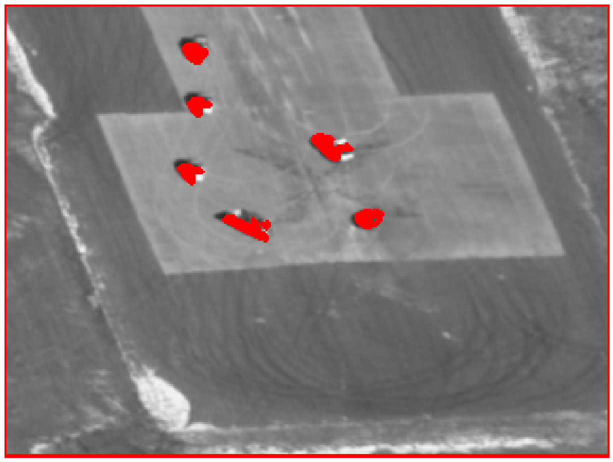
Q3.3



Frame 30

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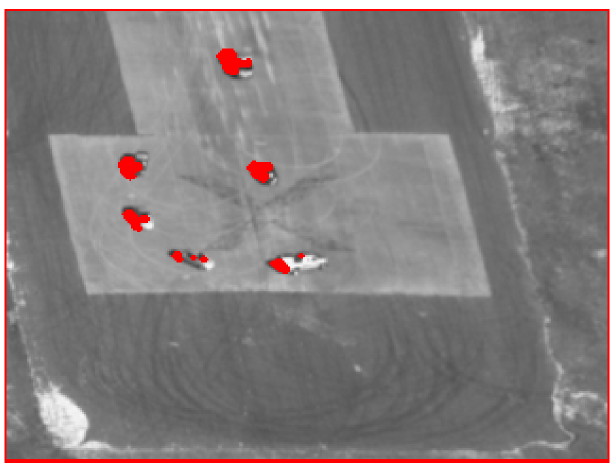

Frame 60

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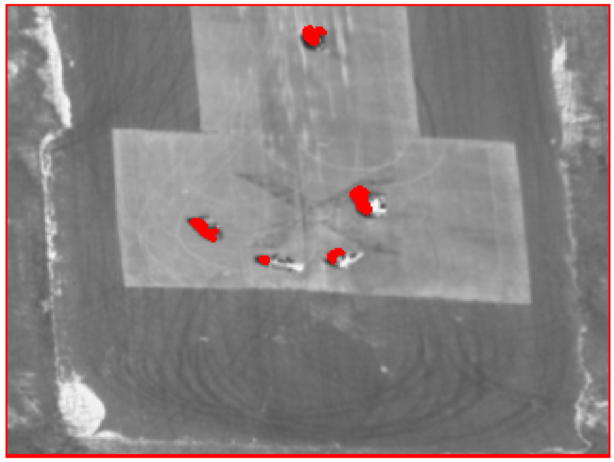

Frame 90

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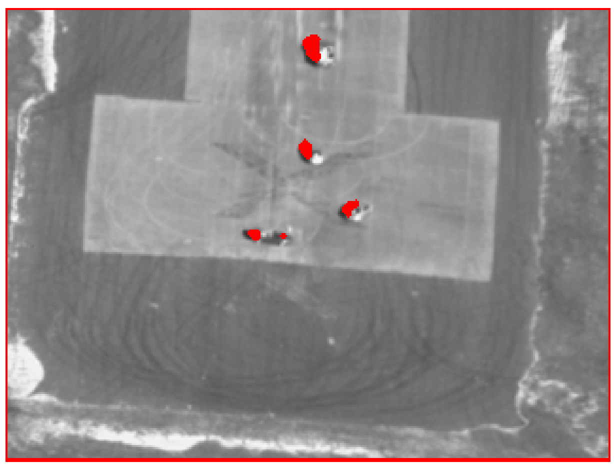

Frame 120

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Q4.1

Because the most time consuming tasks such as computing the gradient of the image, evaluating the jacobean, computing the steepest descent images and computing the Hessian could be pre-computed. So doing the gradient descent optimization iterations, the aforementioned computations wouldn't be repeated.