1.1

(1) It is the Jacobian of W(x;p) which is the partial derivatives of warp function

$$\begin{bmatrix} \frac{\partial W_x}{\partial p_1} & \frac{\partial W_x}{\partial p_2} & \frac{\partial W_x}{\partial p_3} & \frac{\partial W_x}{\partial p_4} & \frac{\partial W_x}{\partial p_5} & \frac{\partial W_x}{\partial p_6} \\ \frac{\partial W_y}{\partial p_1} & \frac{\partial W_y}{\partial p_2} & \frac{\partial W_y}{\partial p_3} & \frac{\partial W_y}{\partial p_4} & \frac{\partial W_y}{\partial p_5} & \frac{\partial W_y}{\partial 6} \end{bmatrix}$$

(2) In this case, A = $\frac{\partial I_{t+1}(x')}{\partial x'^T} \frac{\partial W(x;p)}{\partial p^T}$ and b = $I_t(x) - I_{t+1}(x')$

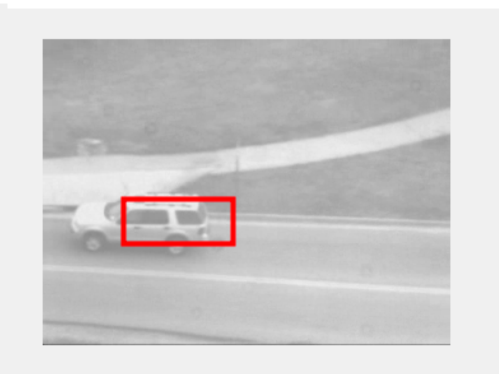
(3)$A^T A$ which is the Hessian matrix must be invertible in order to solve the least squares approximations. And the eigenvalues of the Hessian matrix should not be too small.

1.3

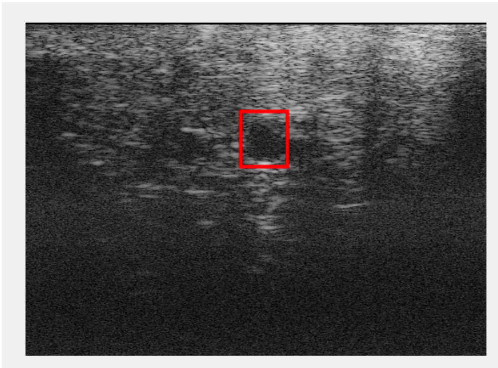
frame1

frame100

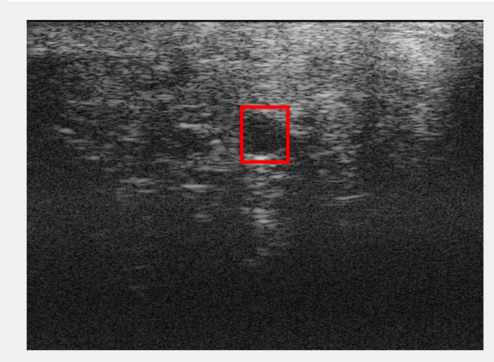
frame200



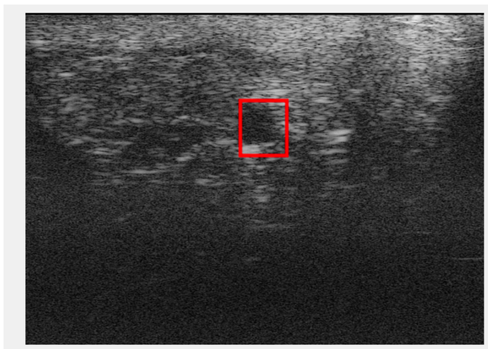
frame400



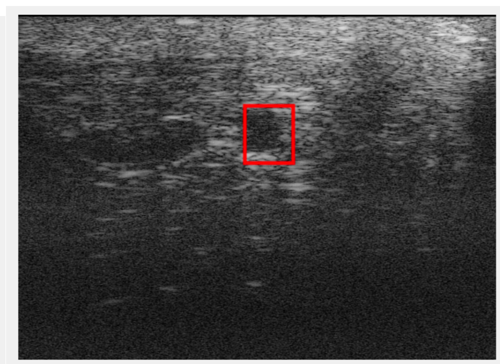
frame5



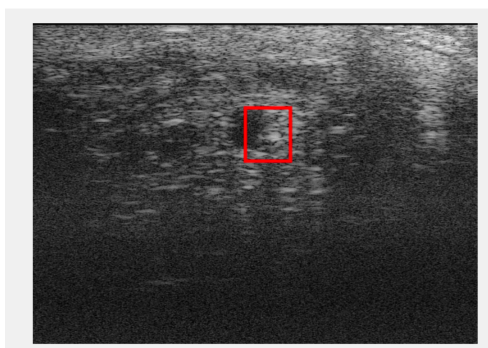
frame25



frame50



frame75



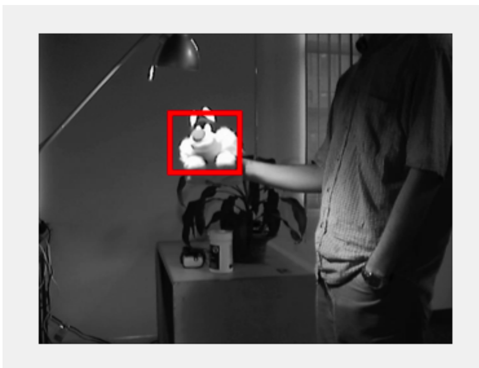
frame 100

2.1

$$\min_{\mathbf{p},\mathbf{w}} = \sum_{\mathbf{x}\in\mathbb{N}} ||\mathcal{I}_{t+1}(\mathbf{x}+\mathbf{p}) - \mathcal{I}_t(\mathbf{x}) - \sum_{k=1}^{K} w_k \mathcal{B}_k(\mathbf{x})||_2^2 \ .$$

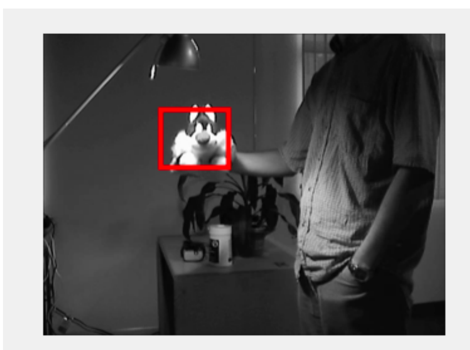
This equation given by the write up can be rewritten with [I_x, I_y,B1,…,Bk]*[Δp,w1,…wk]'
So [∇T,B]*[Δp,w] = $I_{t+1} - I_t$. Let's set [$\nabla T, B$] to H, we can get
[Δp,w] = inv($H^T H$)$*$ $H^T * (I_{t+1} - I_t)$

2.3



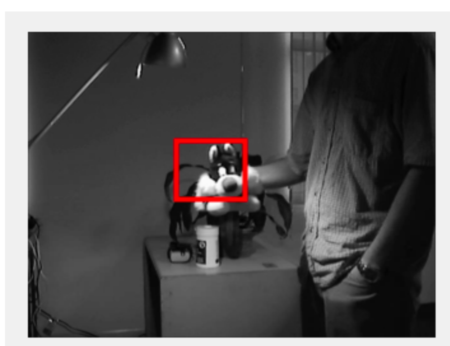
frame1

frame200



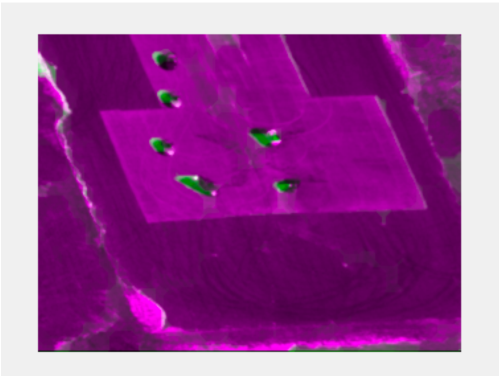
frame300

frame350

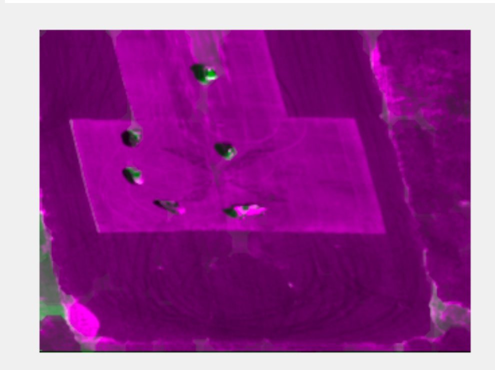


frame 400

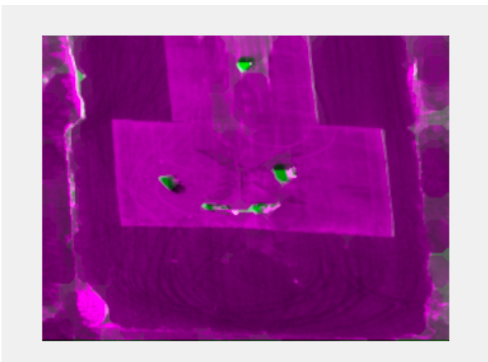
3.3



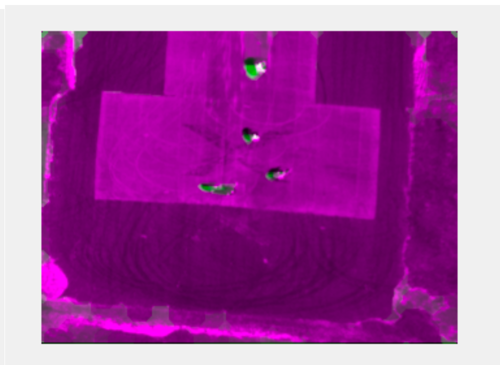
frame30



frame60



frame90



frame120