Pedestrian detection combining RGB and dense LIDAR data

We propose novel strategies for depth upsampling and contextual fusion that together lead to detection performance which exceeds that of the RGB-only systems.

原始检测方法：HOG(histogram of oriented gradients), sliding-window

We study the impact of depth inputs on pedestrian detection using registered pairs of RGB and Velodyne 3D point clouds.

We investigate depth map upsampling and image-depth fusion strategies and compare the relative merits of the two sensing modalities using a fixed experimental setup: same base detector.

稀疏的雷达点上采样：在图像平面，对深度上采样：

$$D_p = \frac{1}{W_p} \sum_{q \in \mathcal{N}} G_{\sigma_s}(\|p-q\|) G_{\sigma_r}(|I_q|)\, I_q$$

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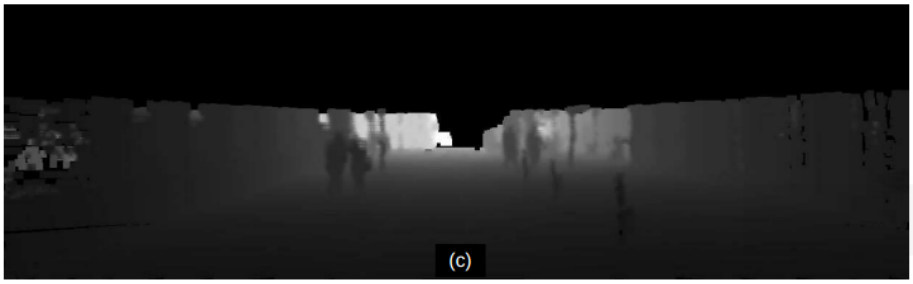
Gr = x[k+2*sd]/mr;
Gs =  ( (u - x[k])*(u - x[k]) + (v+dim[0]-x[k+sd])*
(v+dim[0]-x[k+sd]) );
WGain = 1/sqrt(Gs*Gr);
//mexPrintf("Filter Gain = %f\n",WGain);
S = S + WGain;
Y = Y + WGain*(x[k+2*sd]);
```

每个点周围5*5区域内的点，第一个权重是距离权重，距离中心p越远权重越小，第二个是误差权重，激光雷达距离越远误差越大，5×5区域内的点，深度越大，则权重越小，注意上面取了倒数。

效果：



data fusion:

fused early

fused at the feature level

fused at decision level