A Survey of Fixed-Class Object Tracking Methods

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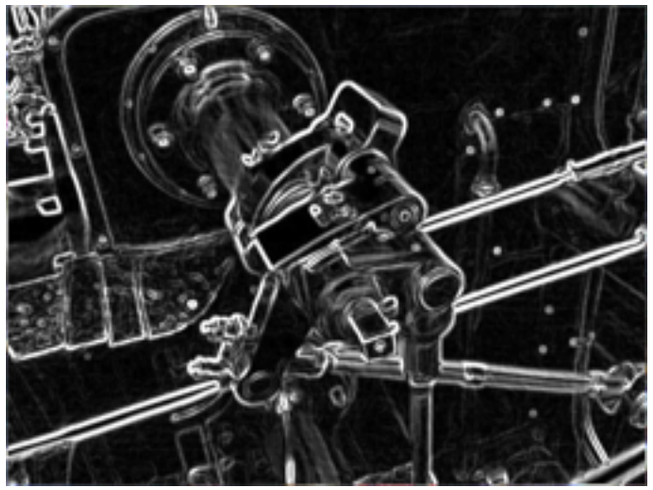
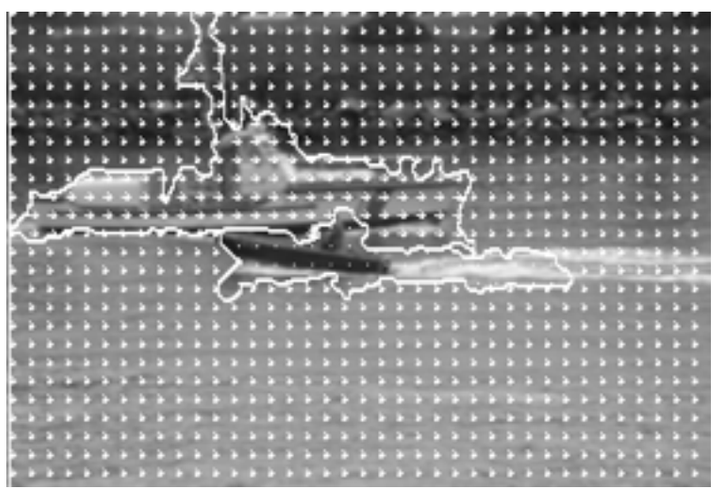
Problem Definition

- Given a video and a fixed object class, track the motion of all objects of the given class over time.

- Important problem with many applications.

Salient Features



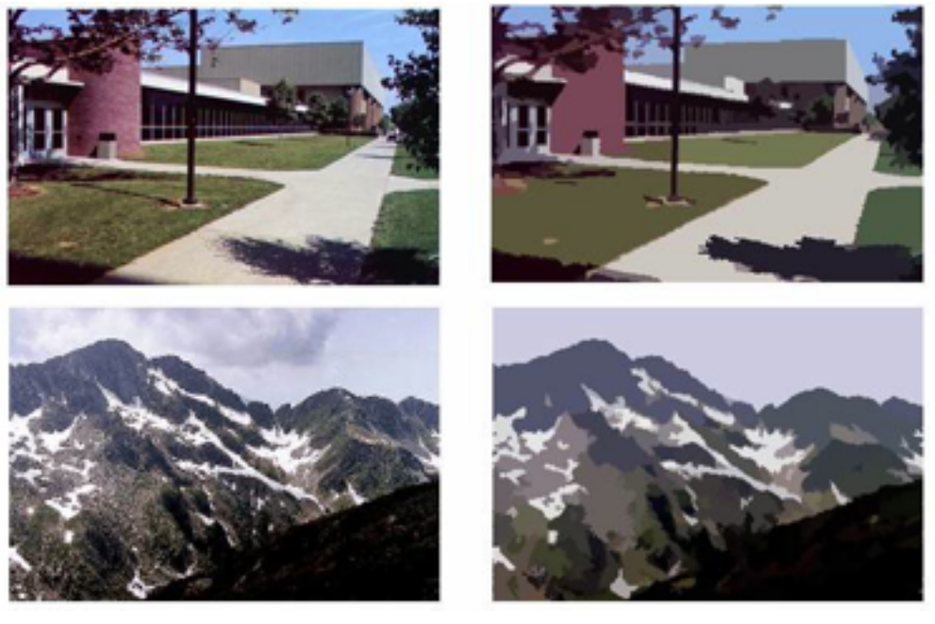


Types of Object Tracking

- Point tracking.
- Kernel tracking.
- Silhouette tracking.

Unsupervised Approaches

- Background subtraction.
- Image segmentation.



Deficiencies

What Works?

- *Online Object Tracking: A Benchmark,* by Wu, Lim, et al. (2013)
- Two approaches to classification and tracking.
- Adaptation through online learning.

SCM and ASLA

- Sparse active appearance models.
- Commonalities.
- Differences.

$$\min_{\mathbf{s}} \|\mathbf{A}^t\mathbf{s} - \mathbf{p}\|_2^2 + \lambda\|\mathbf{s}\|_1$$

Struck

- Structured-output SVM.
- Classification and tracking.
- Online learning.

$$
\begin{aligned}
\min_{\mathbf{w}} \quad & \frac{1}{2}\|\mathbf{w}\|^2 + C\sum_{i=1}^{n}\xi_i \\
\text{s.t.} \quad & \xi_i \geq 0 && \forall i \\
& \langle \mathbf{w}, \delta\mathbf{\Phi}_i(y)\rangle \geq \Delta(\mathbf{y}_i, \mathbf{y}) - \xi_i && \forall i, \mathbf{y} \neq \mathbf{y}_i
\end{aligned}
$$

Comparison

- When SCM and ASLA perform better.

- When Struck performs better.

Conclusions

- Background subtraction and image segmentation are unreliable.
- SCM and ASLA.
- Struck.
- Future methods.