

## Video-Based Moving Object Detection

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## TARGET DETECTION BY BACKGROUND SUBTRACTION

If:

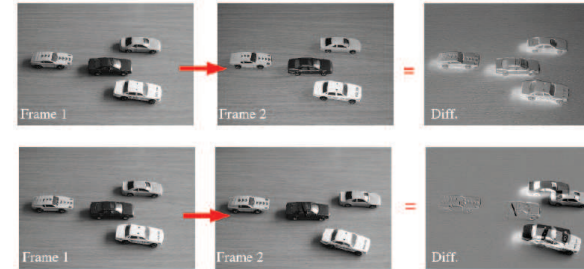
- Camera  with no autofocus/gain
- Illumination constant
- Largely isolated moving objects

use background subtraction

$$| \text{current} - \text{background} | > \text{threshold}$$

## TARGET DETECTION BY IMAGE DIFFERENCING

If you don't know anything about the video other than frames are consecutive and video rate is fast compared to scene motion



[Morris 04]

**Problems:** Illumination changes, overlapping changes, scene vibrations

## BACKGROUND SUBTRACTION CODE

```
% sub background & select pixels with a big difference
fore = (abs(Imwork(:,:,1)-Imback(:,:,1)) > 10) ...
      | (abs(Imwork(:,:,2) - Imback(:,:,2)) > 10) ...
      | (abs(Imwork(:,:,3) - Imback(:,:,3)) > 10);

% erode to remove small noise
foremm = bwmorph(fore,'erode',2);

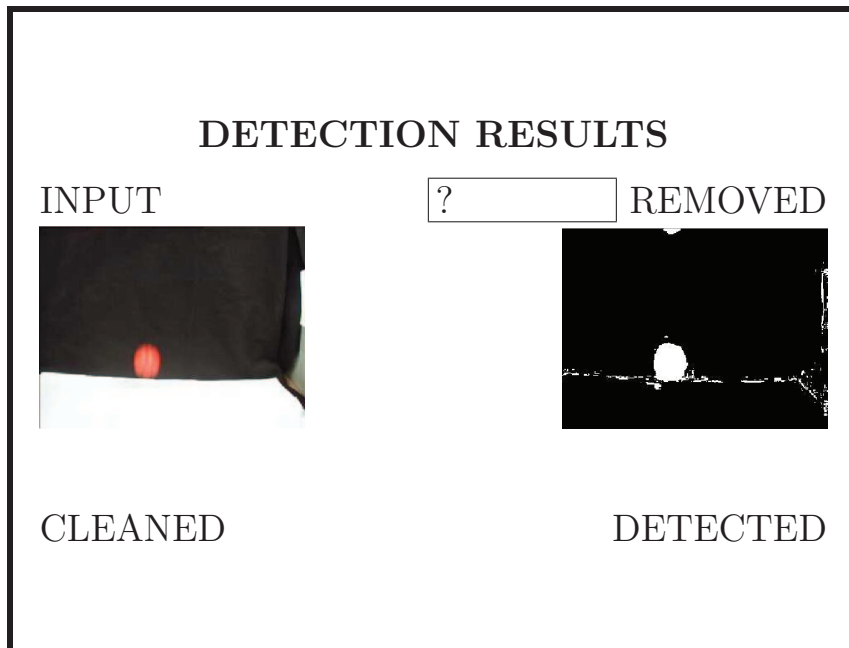
% select largest object
labeled = bwlabel(foremm,4);
stats = regionprops(labeled,['basic']);
[N,W] = size(stats);
```

```

% do bubble sort (large to small) on regions in case
% there are more than 1
for i = 1 : N
    id(i) = i;    % aux variable to hold region id
end
for i = 1 : N-1
    for j = i+1 : N
        if stats(i).Area < stats(j).Area
            tmp = stats(i);
            stats(i) = stats(j);
            stats(j) = tmp;
            tmp = id(i);
            id(i) = id(j);
            id(j) = tmp;
        end
    end
end

% get center of mass and radius of largest

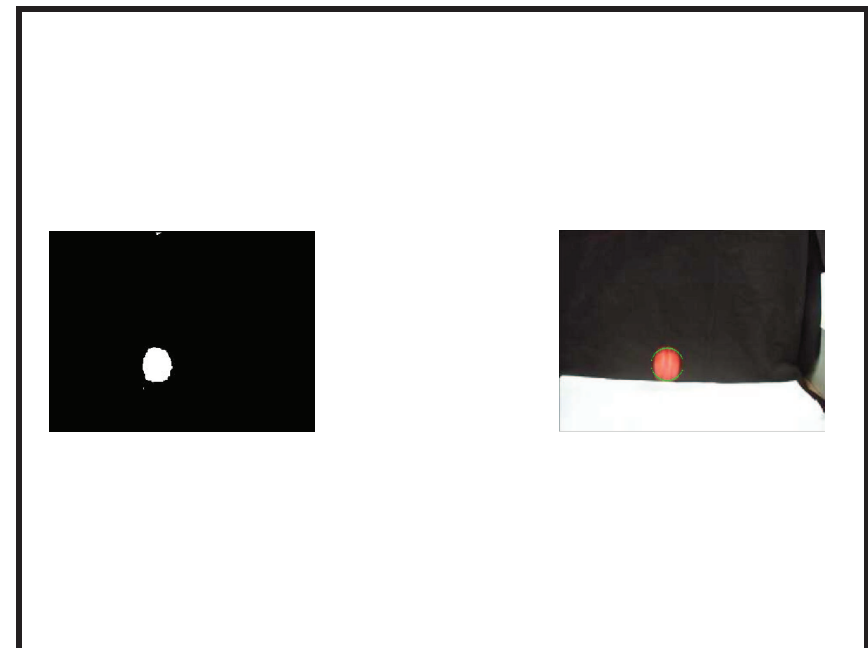
```



```

centroid = stats(1).Centroid;
radius = sqrt(stats(1).Area/pi);

```



## What's wrong?

- Moving ball blurred
- Noisy observations
- Potentially poor contrast

We can track of positions for ball in frames  
 $0 \dots N$

Would like ability to predict position in frame  
 $N + 1$

So: incorporate  in tracker

## What We Have Learned

1. Moving object detection by  or inter-frame differencing
2. Some problems that arise with the methods