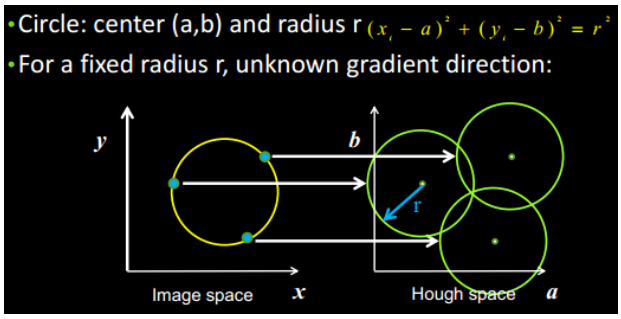
2B-L2 Hough transform - Circles

2017/11/13 02:59

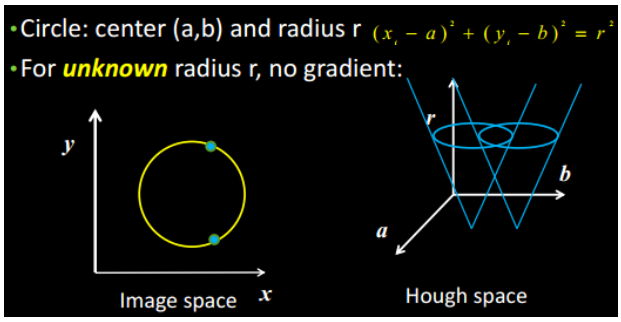
1. 2. Detecting Circles with Hough



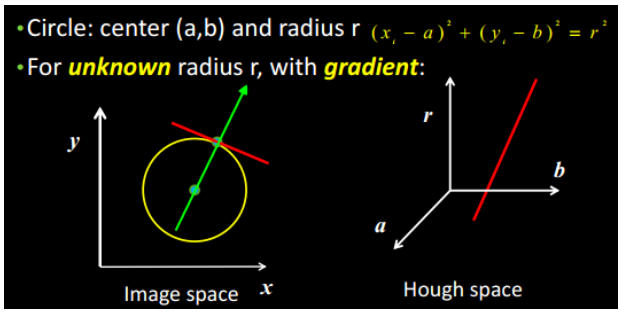
i. duality: one point in xy is a circle with r in ab; vise versa

ii. the intersection point of these three circles in ab defines a circle in xy

1. 3. Hough Transform for Circles



i. when r is not know, the hough space become 3 dim, abr. still, to find the intersection. but compuationaly very expensive

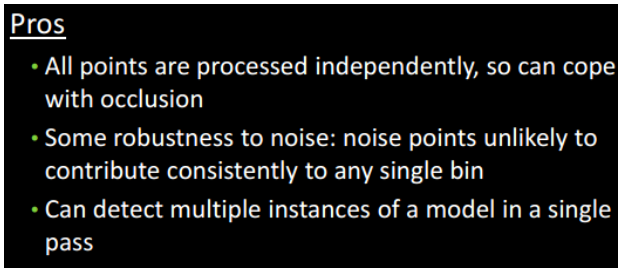


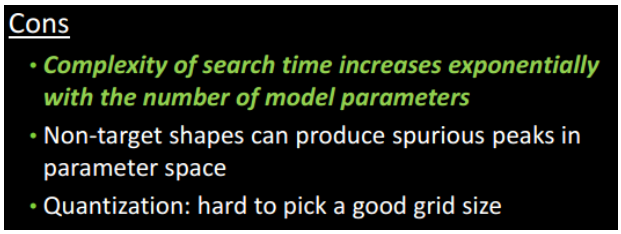
1. the gradient of one point in the circle restrict the radius to be a line in the abr space

1. 4. Algorithm for Circles

```
For every edge pixel (x,y) :
    For each possible radius value r:
        For each possible gradient direction θ:
            %% or use estimated gradient
                a = x – r cos(θ)
                b = y + r sin(θ)
                H[a,b,r] += 1
        end
    end
end
```

4. 5. Voting Practical Tips
    a. Minimize irrelevant tokens first (take edge points with significant gradient magnitude)
    b. • Choose a good grid / discretization:
        i. • Too coarse: large votes obtained when too many different lines correspond to a single bucket
        ii. • Too fine: miss lines because some points that are not exactly collinear cast votes for different buckets
    c. Vote for neighboring bins (like smoothing in accumulator array)
    d. • Utilize direction of edge to reduce free parameters by 1
    e. • To read back which points voted for “winning” peaks, keep tags on the votes
5. 6. Pros and Cons





6. 7. End
    a. it’s an old technique, but it still worth learning to extract structure with it