Computer Vision week 7 – Wenting Duan – 21/04/2022 – Object Tracking

**Target tracking**

Tracking – is the problem of estimating the position of a target moving in space, in a timely fashion.

Object tracking- a technique

**Visual tracking**

Prediction – based on known motion model

Update – based on actual and expected knowledge

**Brownian Motion/ Movement**

One of the simplest models for target tracking (also called discrete Wiener process)

When n are zero-mean Gaussian noises

Example of trajectory for a target moving according to Brownian Motion

**Brownian MM: pros & cons**

This model does not consider velocity and orientation of the target

In many ways

**Constant Velocity**

This model is derived from a continuous curvilinear-motion model

Gaussian noise- a statistical noise that has a normal distribution equal to a bell curve, the average of all the noises generated averages out to close to zero

**CVMM:: Pros and Cons**

This is a popular model for nearly constant (piecewise) rectilinear motions

Thanks to the velocity components, it can deal with small occlusions.

With a careful tuning of the parameters, it can be used for non-rectilinear trajectories, if the latter can be locally approximated to rectilinear ones.

**Constant Acceleration & Constant Turn-rate Models**

**Recursive Bayesian Estimation (Bayesian Filter)**

Recursive Bayesian estimators are the most popular techniques used for target tracking (not only in computer vision).

The majority of them belong to two classes:

* Kalman filters
* Particle filters

The core principle is the same:

Assumptions

Given the target state x, and the set of observations Zk = {z1….zk}, the probability of x given Z is called posterior and written as p(x|Z).

Zk includes all observations from time 1 to time k, this means it includes all the past observations

The posterior can be computed using the Bayes rule and the following two assumptions: