**Minutes of Meeting**

**Meeting for: Team Localization**

**Meeting Date: 04.11.2022 (Friday)**

**Meeting Time: 08:15pm to 8:45pm CET**

**Webinar Host:** Madhav

**Keynote Speaker: Mayur**

**Attendees:**

* Mayur
* Madhav
* Kapil
* Ashwin

1. **Introduction to State Estimator:**

* The team works on 3 tasks: **Localization, Mapping and SLAM.**
* Localization plays a major role in AV.
* For this data from 3 sensors could be used**: IMU sensor, GPS sensor and odometer**.
* Disadvantages of **Dead Reckoning** (IMU and Odometer) – Final position might be different from intended position.
* Drawbacks of GPS - Bad position in low signal areas: eg., in tunnels.
* These drawbacks are minimized by combining both IMU and GPS using **state estimator**.
* State Estimator families: **Kalman filter, Information filter, Particle Filter**.
* For now we will focus on Kalman filter.

1. **Kalman filter:**

* Process model is assumed as Gaussian distribution.
* Kalman Filter has 2 loops: **Prediction loop and Estimation or Measurement loop**
* Prediction loop – we consider various motion models and find mean and variance.
* Estimation loop – We find the error function and recalculate mean and variance.

1. **Tuning Kalman Filter:**

* Initializing motion model
* Develop Process Noise Model and
* Develop Measurement Noise Model

1. **Extended Kalman Filter:**

* Kalman filter is capable of processing only linear model.
* So to work with non-linear model, Extended Kalman filter is used.

1. **Target for next 2 weeks:**

* Need to understand different types of motion model available.
* Should try to implement simple 1D Kalman filter.
* Check how could be implemented (or useful) for localization purpose.
* Need to perform Morkov localization.