

Multiple Object Tracking: Course Outline

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Outline

- 1 Tracking
- 2 Single Object Tracking
- 3 Multiple Object Tracking
- 4 Random Finite Sets
- 5 Multiple Object Tracking Using Conjugate Pairs

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- 1 Tracking
- 2 Single Object Tracking
- 3 Multiple Object Tracking
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Outline

1 Tracking

- Introduction
- Bayesian Filtering
- Motion Modeling
- Measurement Modeling
- Kalman Filter: A Bayesian Filtering Example

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1 Tracking

- Introduction
- Bayesian Filtering
- Motion Modeling
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Introduction

- Definitions
- Types of Tracking.
- Challenges in MOT.

Outline

1 Tracking

- Introduction
- Bayesian Filtering
- Motion Modeling
- Measurement Modeling
- Kalman Filter: A Bayesian Filtering Example

Bayesian Filtering

- Bayes Theorem
- Prediction and Update Recursion

Outline

1 Tracking

- Introduction
- Bayesian Filtering
- **Motion Modeling**
- Measurement Modeling
- Kalman Filter: A Bayesian Filtering Example

Motion Modeling

- Object motion model
- Modeling in uncertainty

Outline

1 Tracking

- Introduction
- Bayesian Filtering
- Motion Modeling
- **Measurement Modeling**
- Kalman Filter: A Bayesian Filtering Example

Measurement Modeling

- Sensor measurement model
- Measurement Uncertainties

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- 1 Tracking
 - Introduction
 - Bayesian Filtering
 - Motion Modeling
 - Measurement Modeling
 - Kalman Filter: A Bayesian Filtering Example

Kalman Filter

- Introduction to the Kalman filter
- Practice problem

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Outline

2 Single Object Tracking

- Introduction
- Prediction & Measurement Updates
- Clutter Modeling
- Data Association
- Algorithms
- Gating

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2 Single Object Tracking

- Introduction
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Introduction

- Brief introduction to Single Object Tracking (SOT).
- Challenges in SOT.

Outline

- 2 Single Object Tracking
 - Introduction
 - Prediction & Measurement Updates
 - Clutter Modeling
 - Data Association
 - Algorithms
 - Gating

Prediction & Measurement Updates

- Prediction & Measurement Update for a single object

Outline

2 Single Object Tracking

- Introduction
- Prediction & Measurement Updates
- Clutter Modeling
- Data Association
- Algorithms
- Gating

Clutter Modeling

- Introduction
- Modeling clutter in space

Outline

2 Single Object Tracking

- Introduction
- Prediction & Measurement Updates
- Clutter Modeling
- Data Association
- Algorithms
- Gating

Data Association

- Data association in SOT in the presence of clutter

Outline

2 Single Object Tracking

- Introduction
- Prediction & Measurement Updates
- Clutter Modeling
- Data Association
- **Algorithms**
- Gating

Algorithms

- Nearest Neighbors
- Probabilistic Data Association
- Gaussian Sum Filtering

Outline

2 Single Object Tracking

- Introduction
- Prediction & Measurement Updates
- Clutter Modeling
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Gating

- Removal of unwanted hypotheses.

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 - Introduction: n Object Tracking
 - n Object Measurements Modeling
 - Estimating n Object Density
 - n Object Data Association
 - Algorithms: n Object Tracking
 - Global Nearest Neighbors (GNN)
 - Joint Probability Density Association (JPDA)
 - Multi Hypothesis Tracker

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3 Multiple Object Tracking

- Introduction: n Object Tracking
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 - Introduction
 - Common Random Finite Sets
 - Standard Models in MOT
 - Probabilistic Hypothesis Density Filtering
 - Metrics in MOT

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5 Multiple Object Tracking Using Conjugate Pairs

- Introduction
- Modeling a Changing Number of Objects
- Multi-Bernoulli Mixture Filter
- Poisson Multi-Bernoulli Mixture Filter
- MOT Filter Implementation
- Labels

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5 Multiple Object Tracking Using Conjugate Pairs

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- Modeling a Changing Number of Objects
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