SENSOR FUSION EXPERT

SFE.U4.E5 - FUSION METHODS

Data and Sensor Fusion Applications, Use Cases and Real-Life Examples

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LEARNING OBJECTIVES

The student is able to …

SFE.U4.E4.PC1	The student understands the need and purpose of the fusion methods.
SFE.U4.E4.PC2	The student is able to describe, understand and compare the different fusion methods and their particularities.
SFE.U4.E4.PC3	The student knows the different use cases of each type of fusion method.
SFE.U4.E4.PC4	The student is able to critically select and apply the right sensor fusion method according to the system dynamics and noise characteristics.
SFE.U4.E4.PC5	The student can test, evaluate, and compare different sensor fusion methods.
SFE.U4.E4.PC6	The student can develop algorithms to perceive the world around a vehicle as well as to track, detect, and identify objects and threats over time.

Introduction

- Existing fusion methods are classified into three distinct levels, namely:

  - Merging at the data level

  - Resource-level merging

  - Merging at the decision level

Merging at the data level

- Data obtained from various sensors are simply aggregated or placed in their entirety in a database and will generate more information.
- Merging multiple data from the same object by different sensors will make the data more accurate and more informative than if there were only one sensor.
- The goal is to reduce data noise and increase information quality

Resource-level merging

- Many resources come from raw data, that is, raw data.

- They can be from sensor nodes or from a single data source with multiple sensors.

- Can be combined in by a vector of high-dimensional features.

- This vector is used as input to pattern recognition tasks by a classifier.

Resource-level merging

- Different views of uniting the features have been presented.

- Depending on the type of application, so that these multidimensional vectors can be transformed into articular feature vectors, from which the classification is then carried out.

- Examples of resource-level merging are:

- Resource Aggregation

- time fusion

- Support Vector Machine (SVM) based multisensor fusion algorithm

- Data Fusion Location Algorithm

Merging at the decision level

- It consists of combining the local results of various decision processes or classifiers into a global decision, which is usually a target class or tag.

Merging at the decision level

- Methods that use the combination of local decisions in general:

  - Adaboost,

  - Voting,

  - Multi-view Staking,

  - Hierarchical Weighted Classifier

Choosing the Best Fusion Method

- The best way to choose a merge method is to use a k-fold cross validation method.

- A prediction model with statistical signature dataset to learn to recognize the best merge configuration for a given dataset.

- This is because it fits into one of the domains considered.

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This Training Material has been certified according to the rules of **ECQA – European Certification and Qualification Association.**

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UMINHO – University of Minho (https://www.uminho.pt/PT)

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Thank you for your attention

DRIVES project is project under **The Blueprint for Sectoral Cooperation on Skills in Automotive Sector**, as part of New Skills Agenda.

The aim of the Blueprint is **to support an overall sectoral strategy and to develop concrete actions to address short and medium term skills needs.**

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