

SURF-eDNA

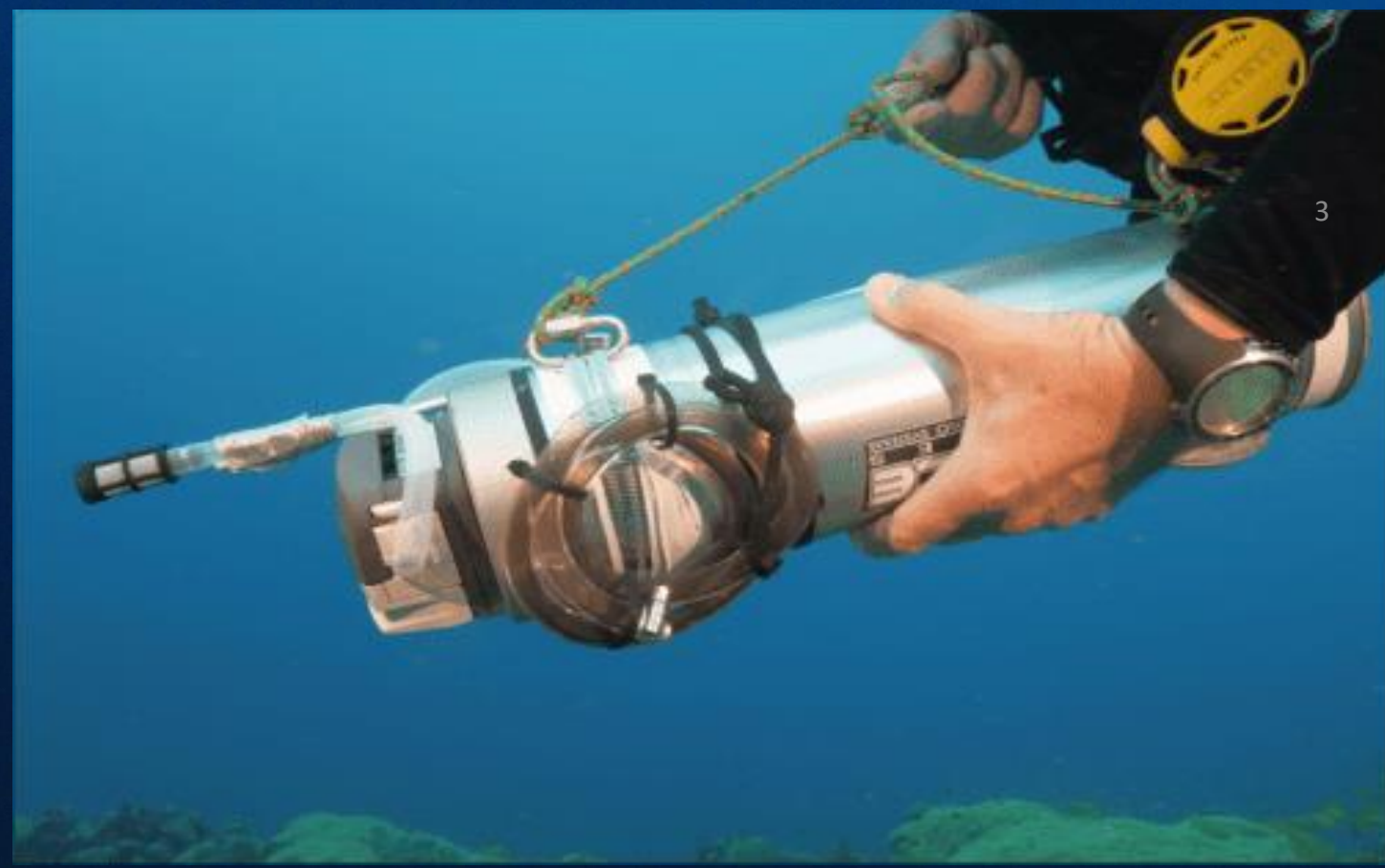


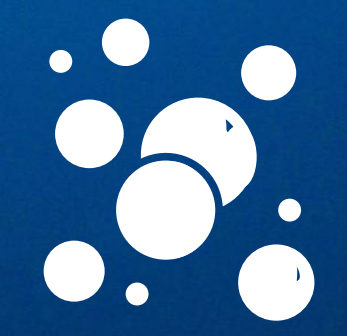
ETH zürich

SoftRobotics
Laboratory



SURF-eDNA





eDNA = environmental-DNA



BAGNI
CALETTA



0-24



Overview

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



1. See-Think-Act Zyklus
2. Optische Navigation
3. Encoder-Decoder Segmentierung
4. Sonar Navigation

See-Think-Act Zyklus

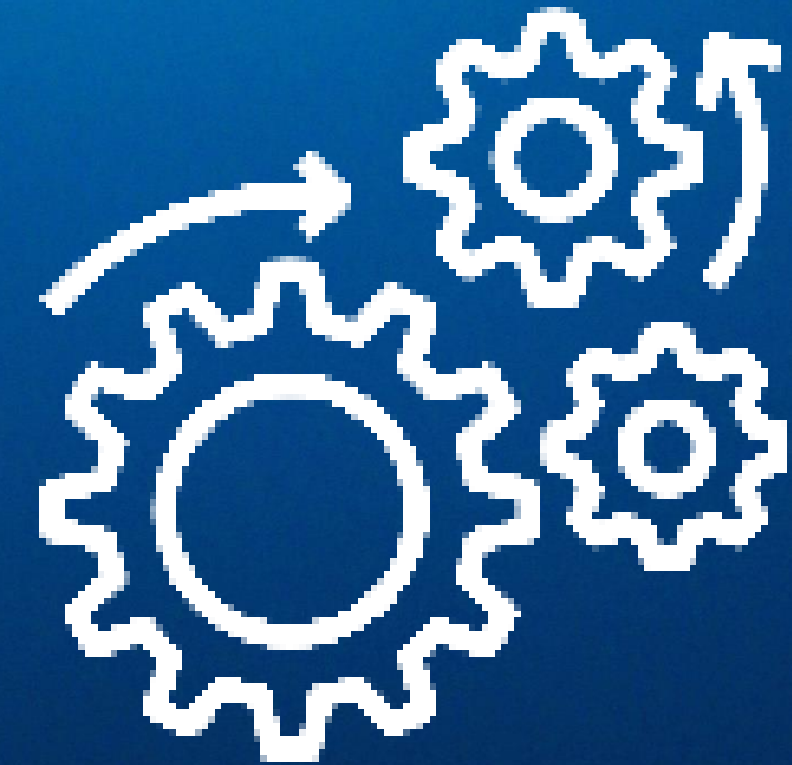
See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



SEE



THINK



ACT

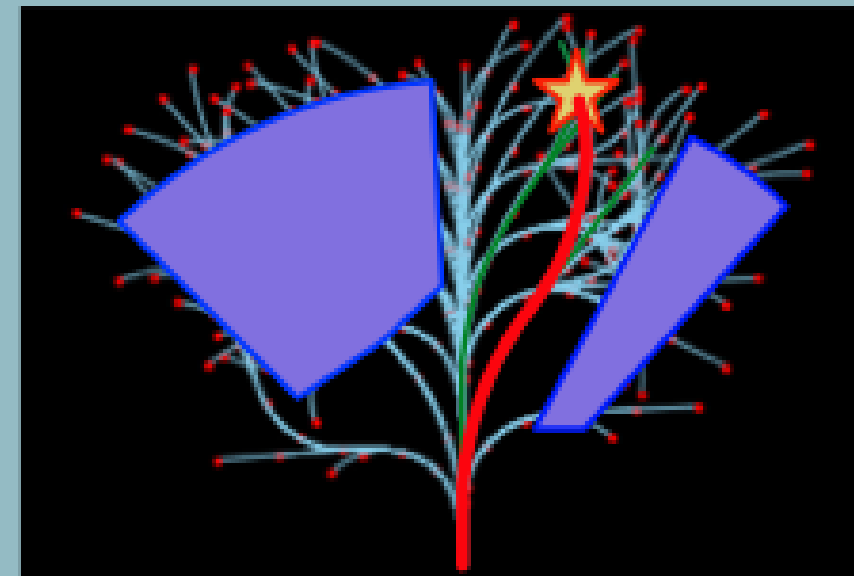
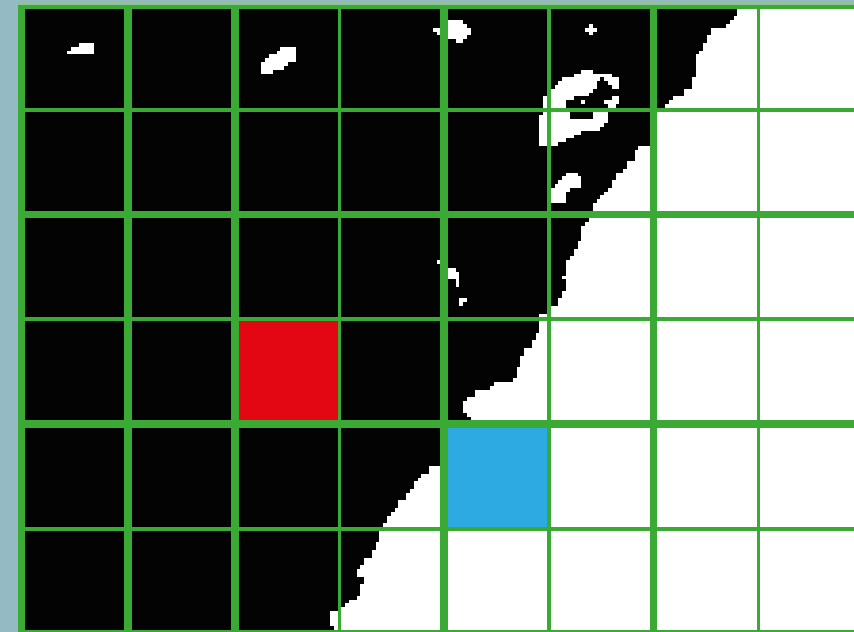
SEE-THINK-ACT Angewandt

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

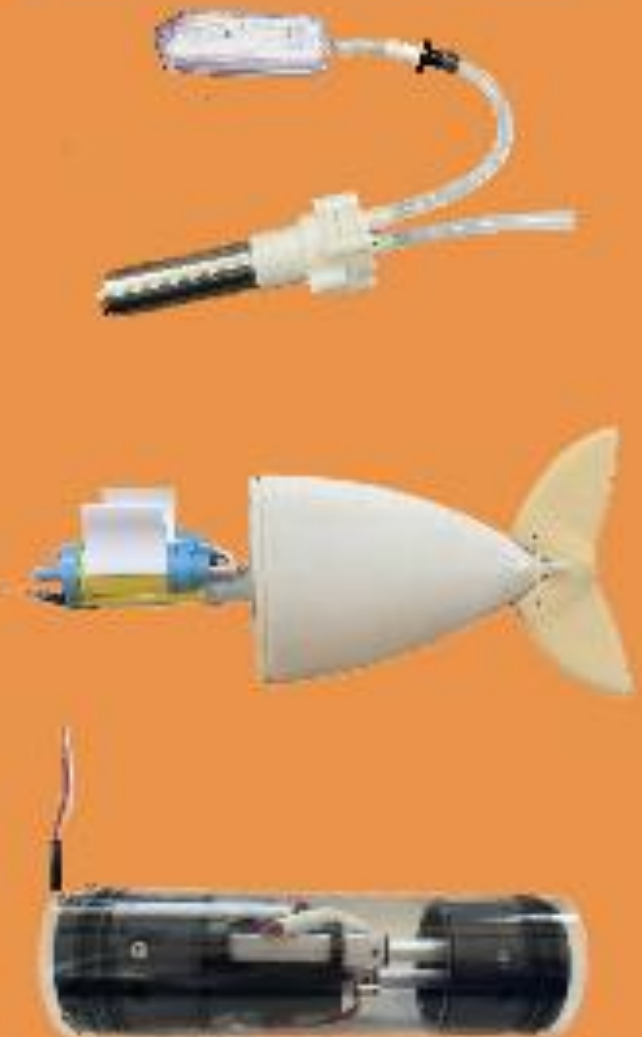
PERCEPTION



THINK



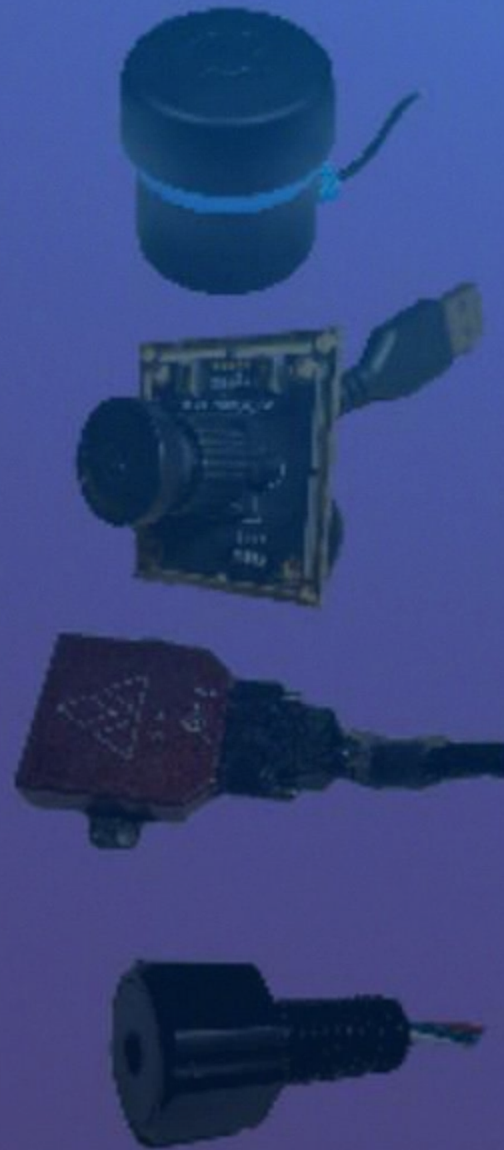
ACTUATION



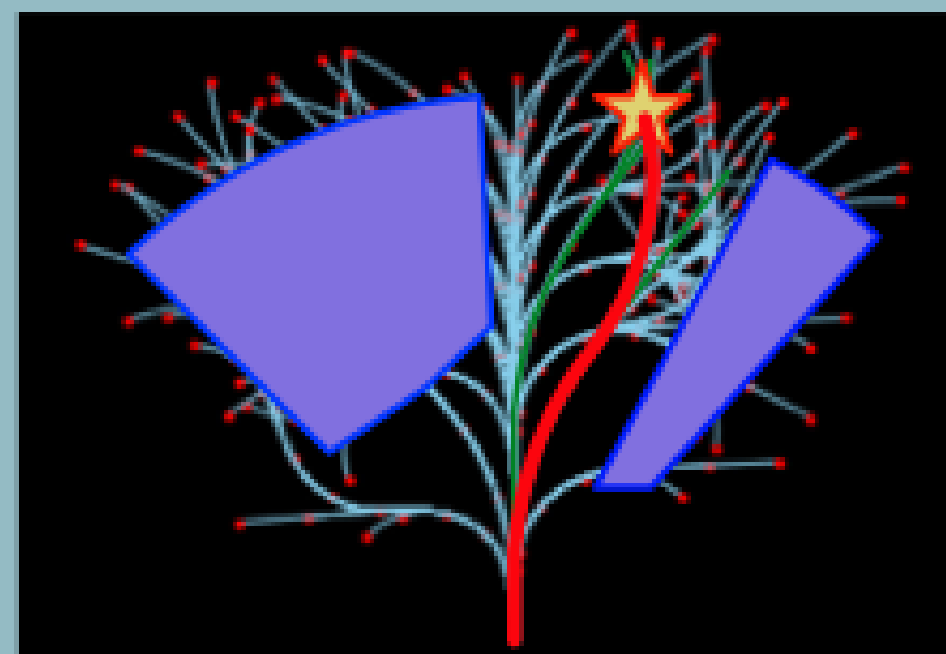
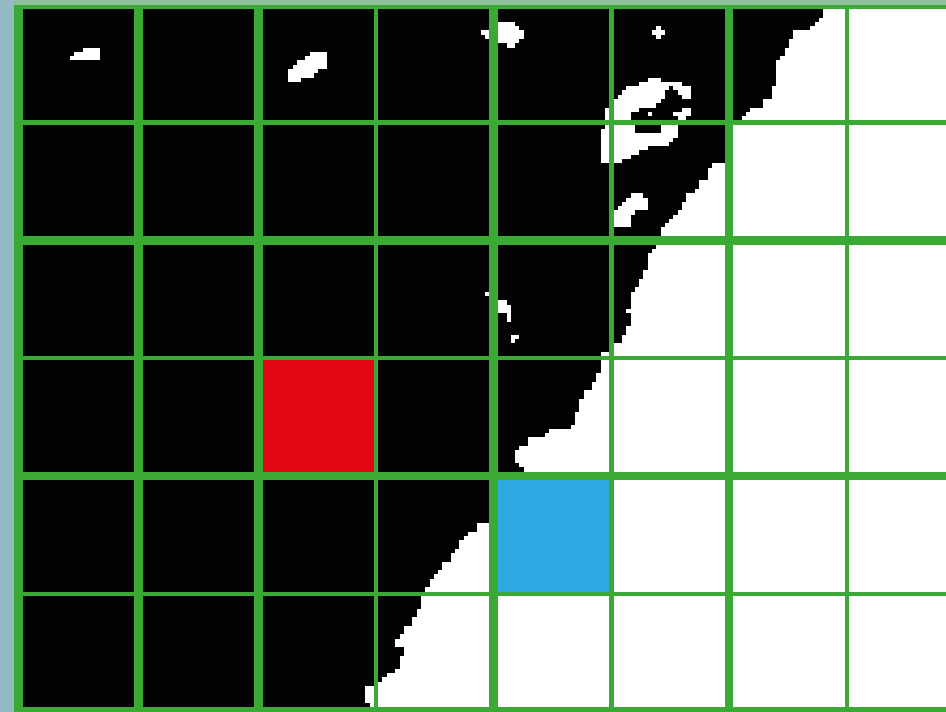
SEE-THINK-ACT Angewandt

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

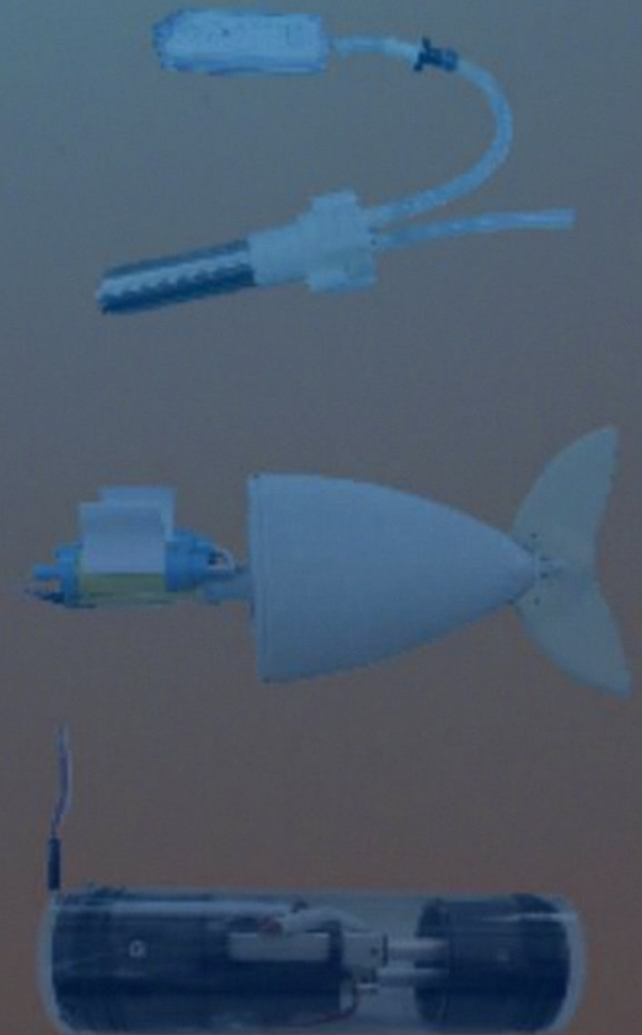
PERCEPTION



THINK



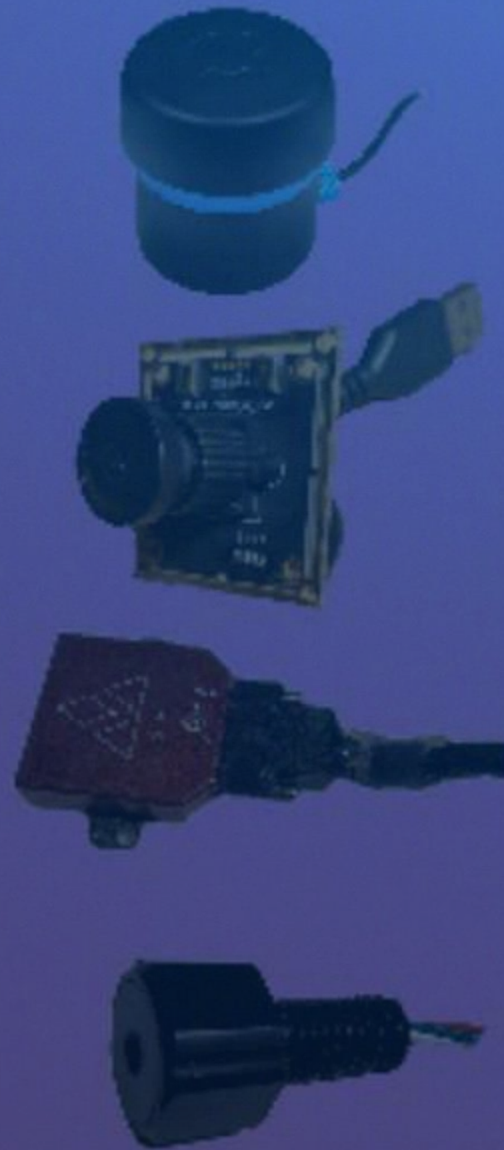
ACTUATION



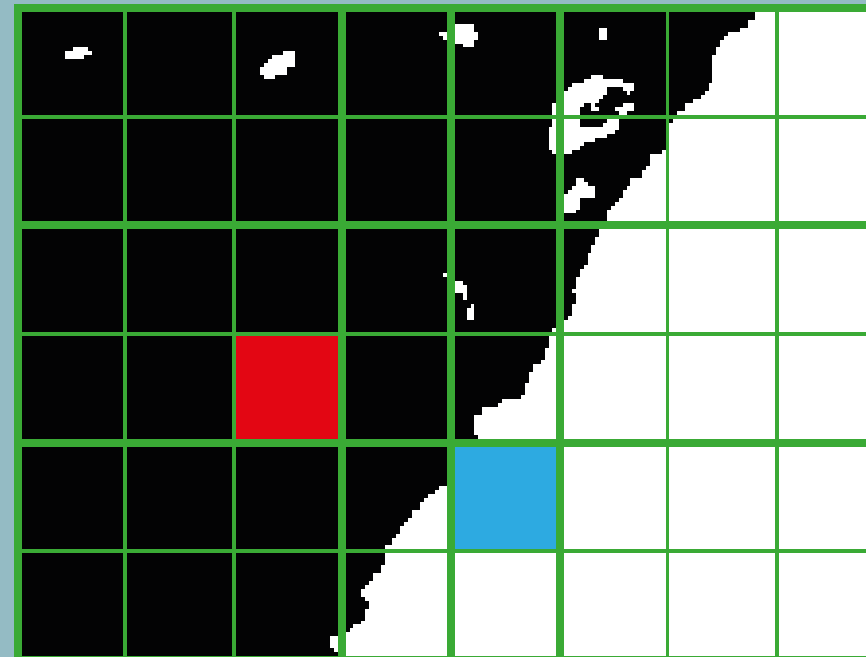
SEE-THINK-ACT Angewandt

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

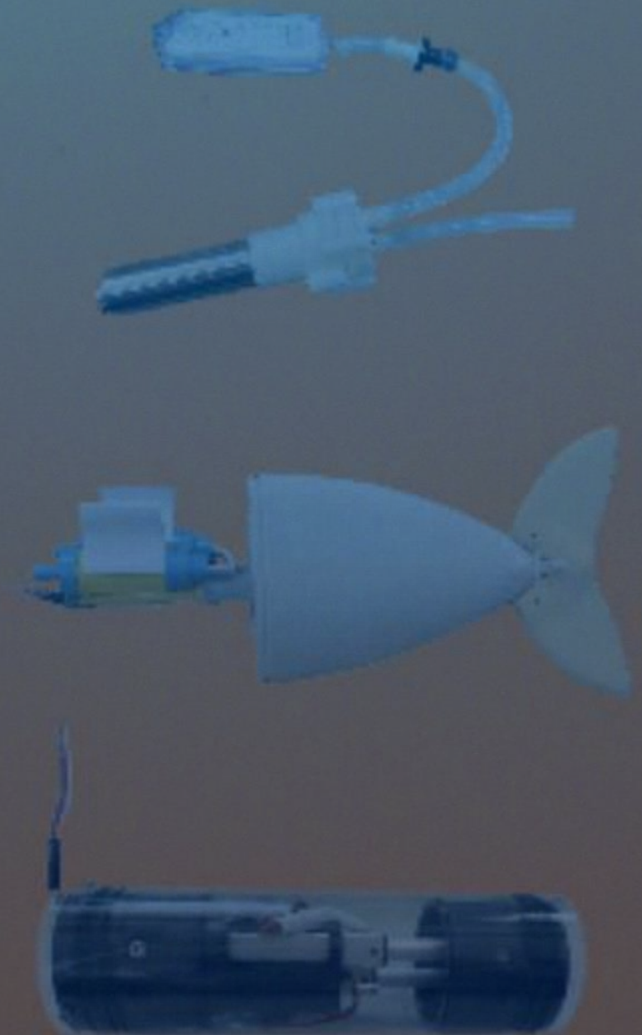
PERCEPTION



THINK



ACTUATION



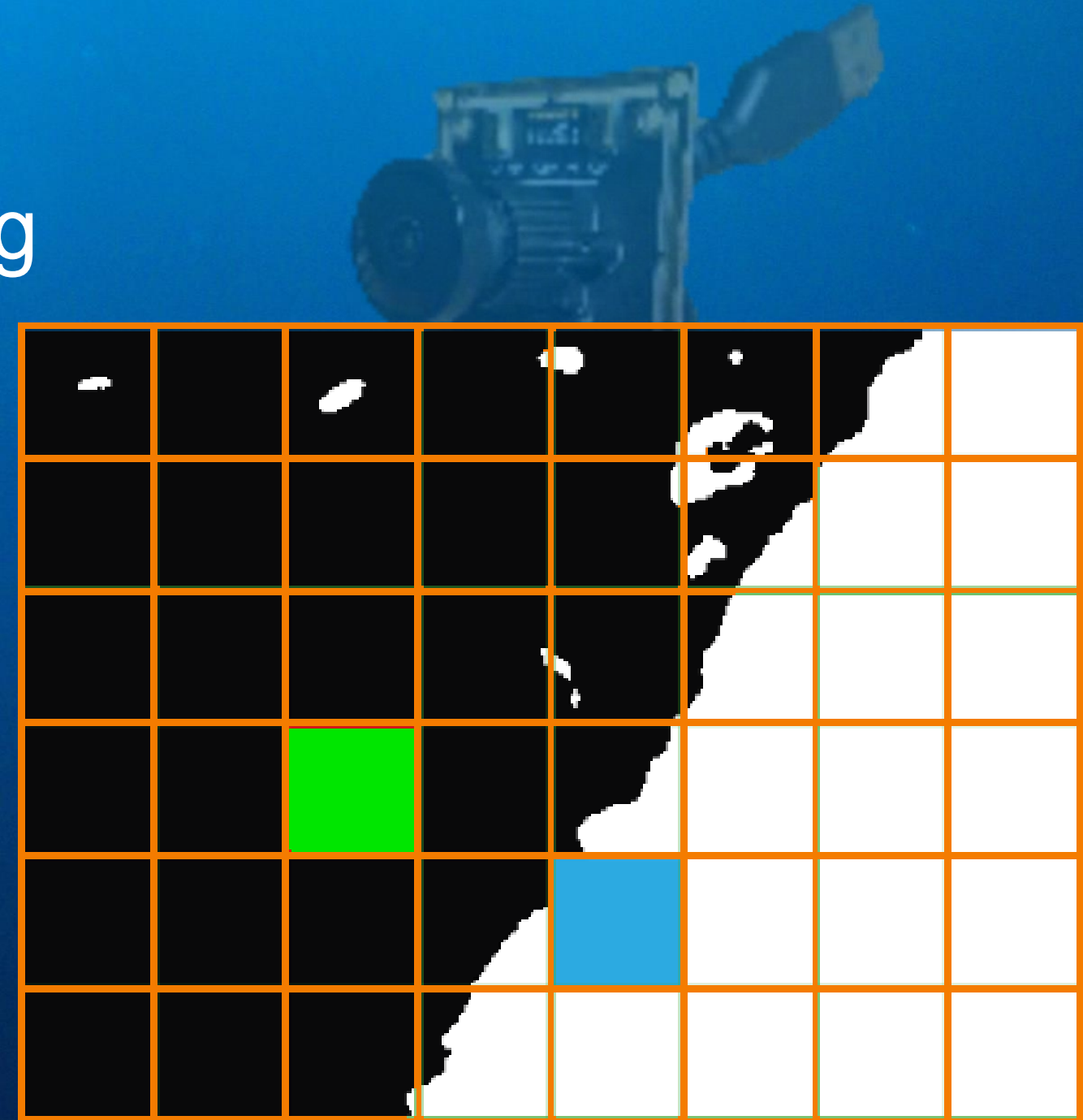


- **Kamera Basierende Wahrnehmung**





- Kamera Basierende Wahrnehmung
- KI Interpretation der Daten



Encoder-Decoder Netzwerk

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Input Image



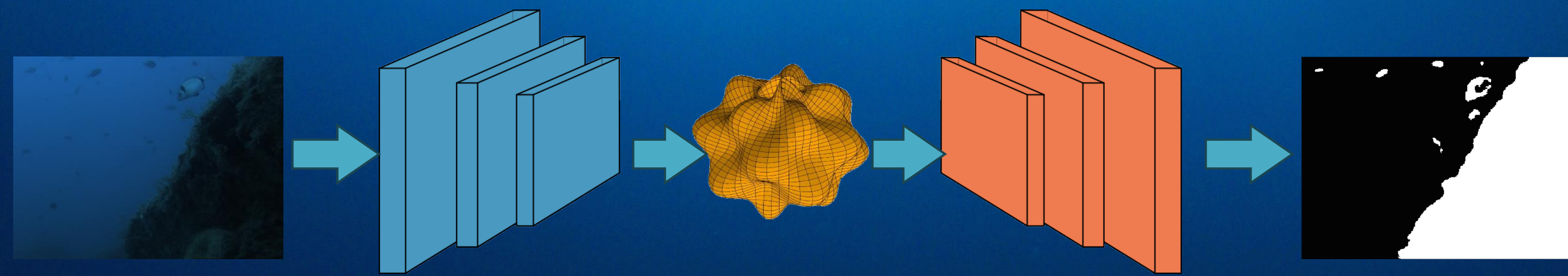
**Encoder/Decoder
Network**



Output Image

Encoder-Decoder Netzwerk

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



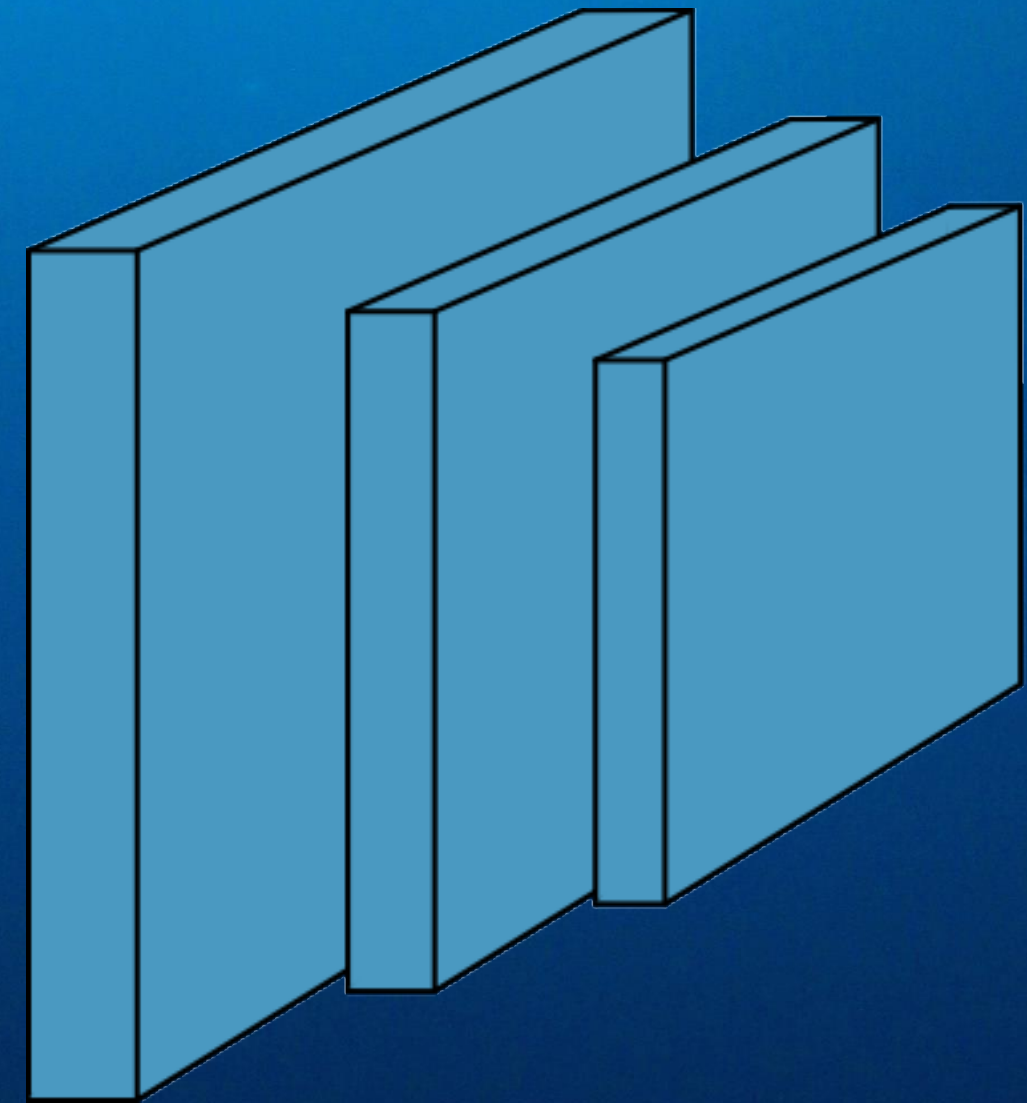
Encoder Decoder Network

Encoder-Decoder Input

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



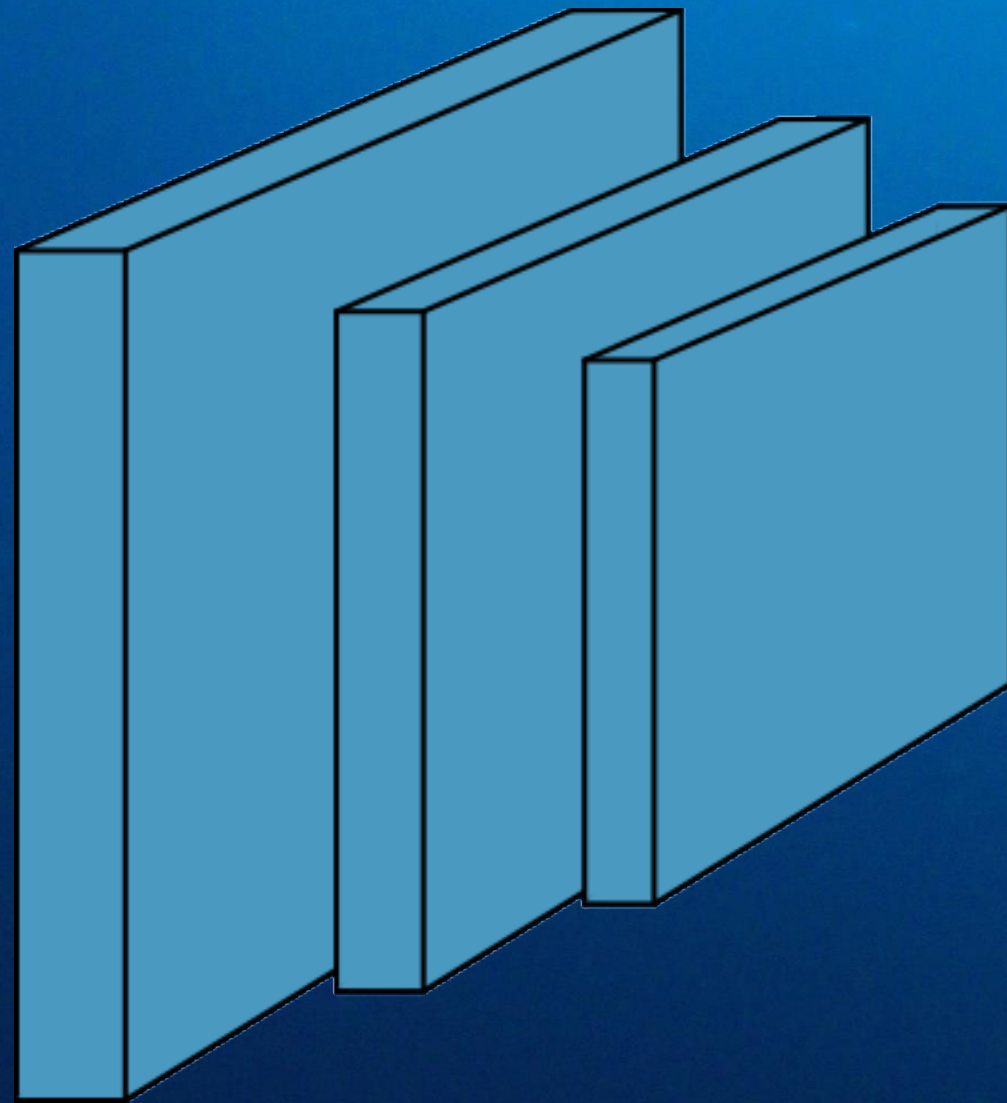
Input Image



Encoder

Encoder Übersicht

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Encoder

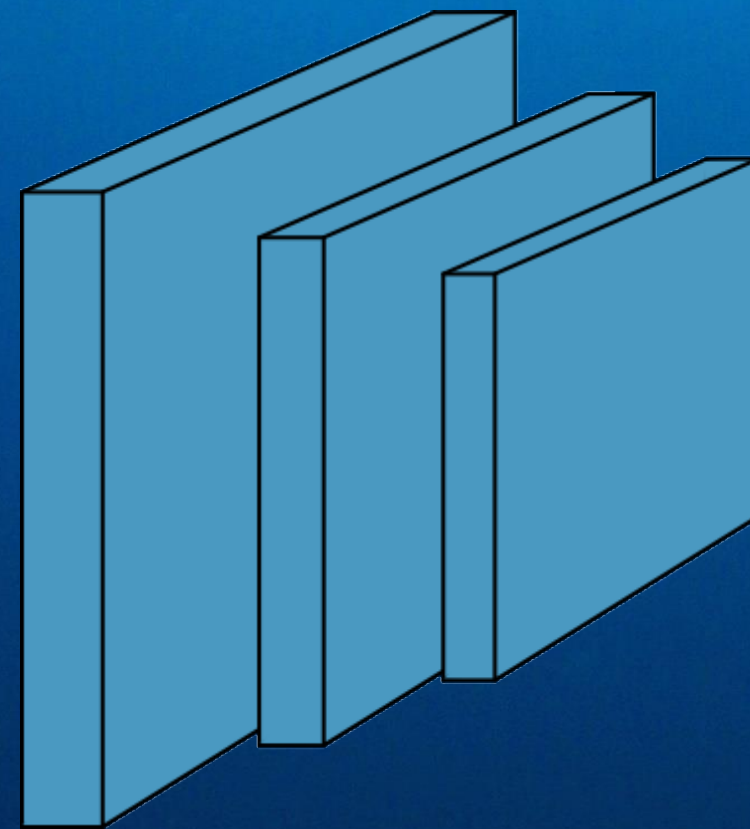
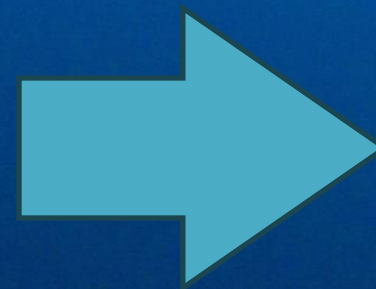
- **Extrahiert Schlüssel Informationen**
- **Komprimiert und Repräsentiert in einfacher Form**
- **Lernt Komplexe Muster**

Latent Space

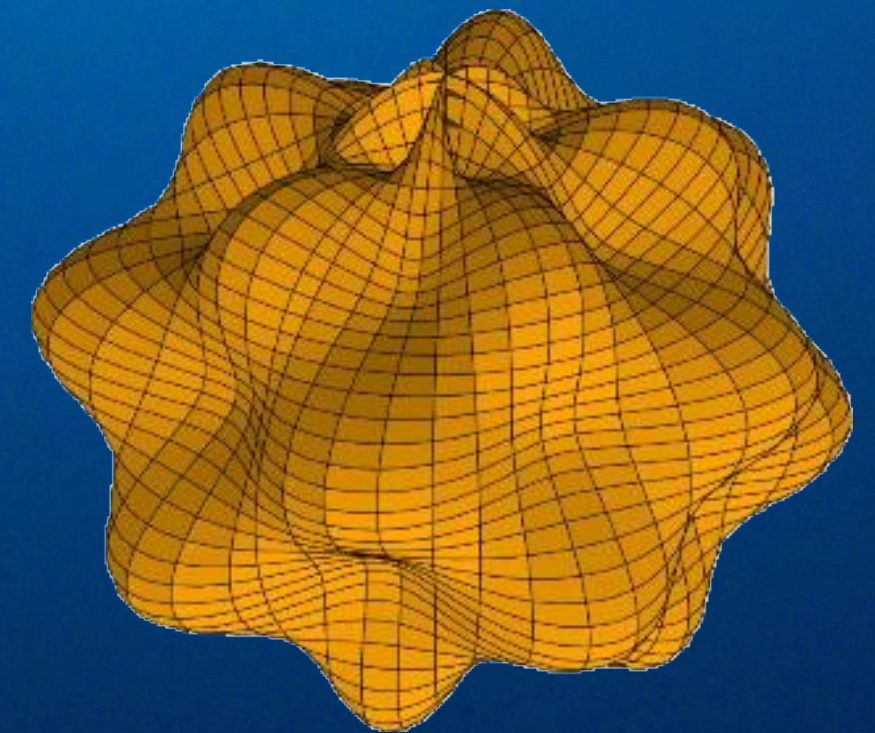
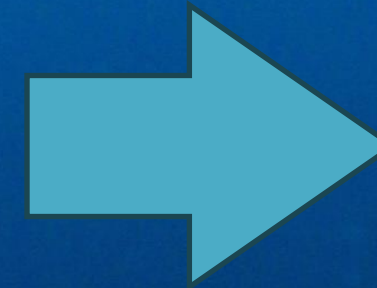
See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Dataset



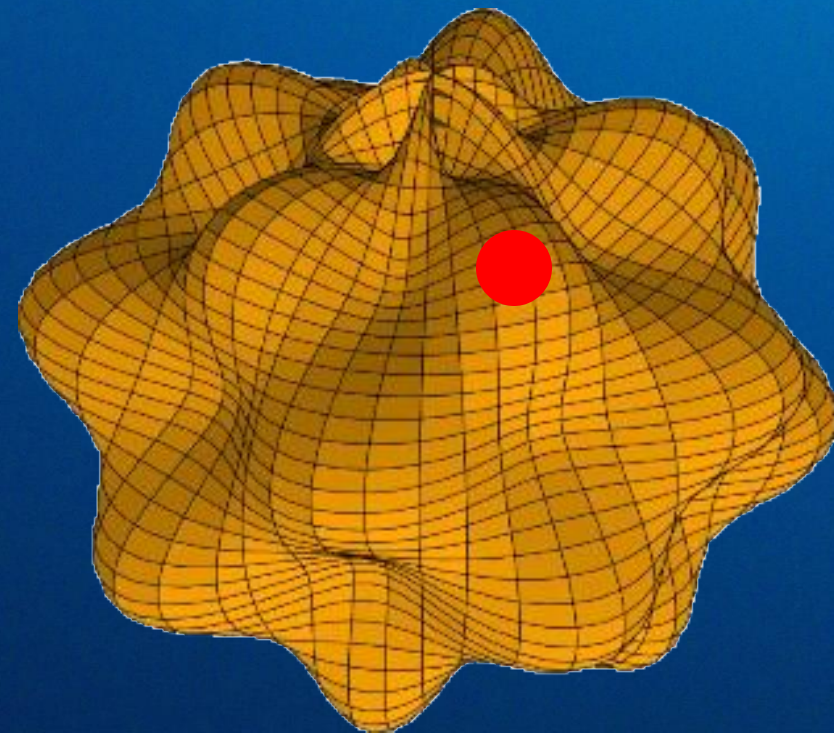
Encoder



Latent Space

Latent Space

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Latent Space

- **Weniger Dimension**
- **Abstrakte Representation des Datenset**
- **Durch Encoder gebildet**

Encoder-Decoder

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

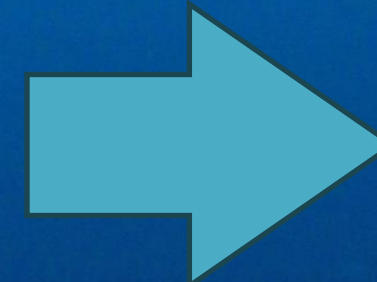
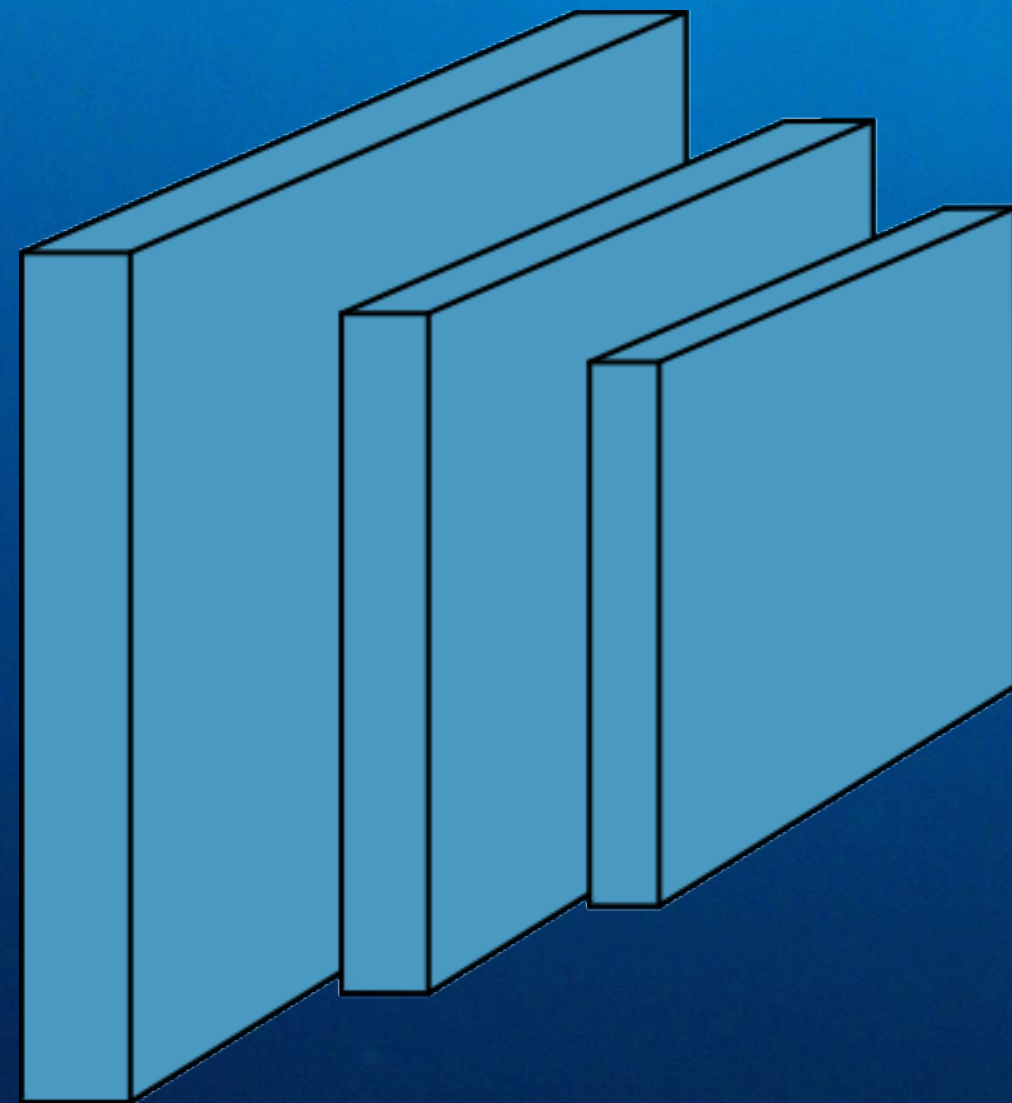
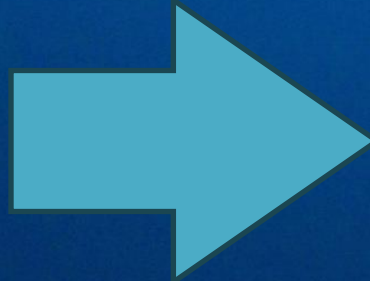
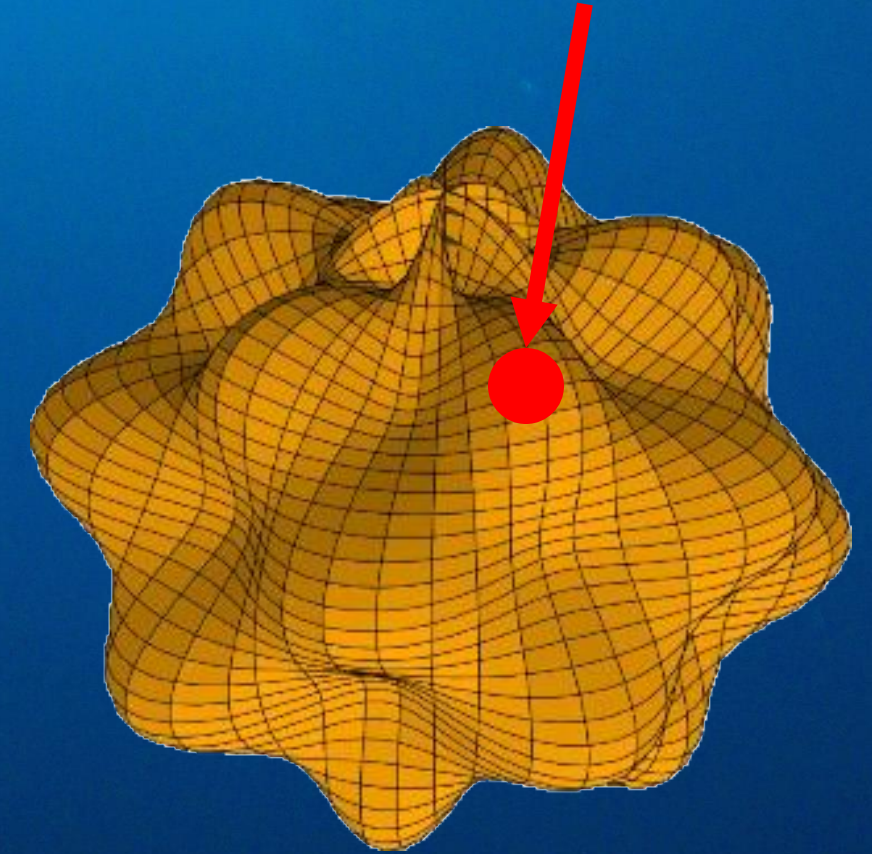


Image Embedding



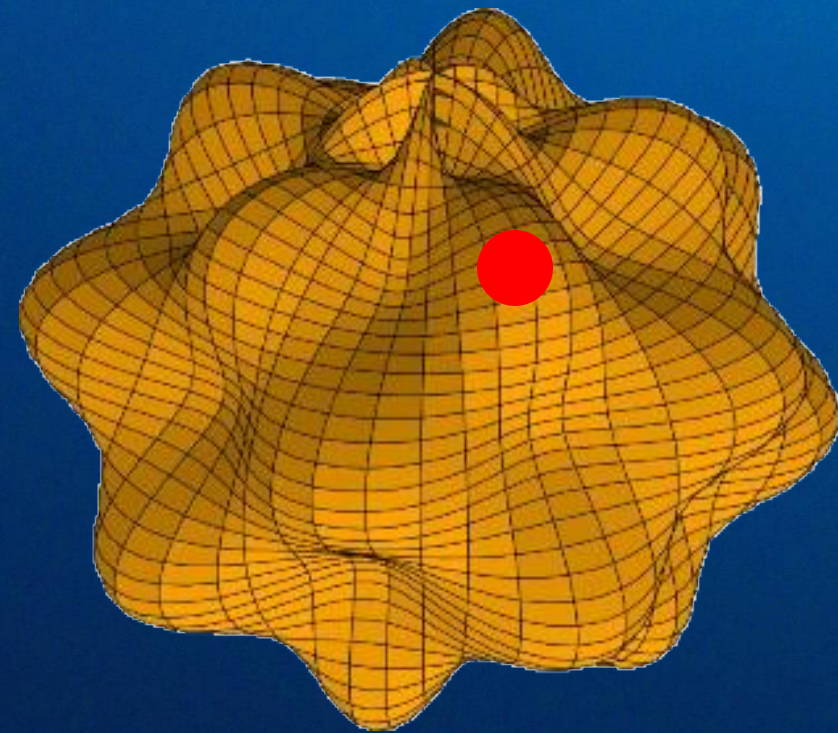
Input Image

Encoder

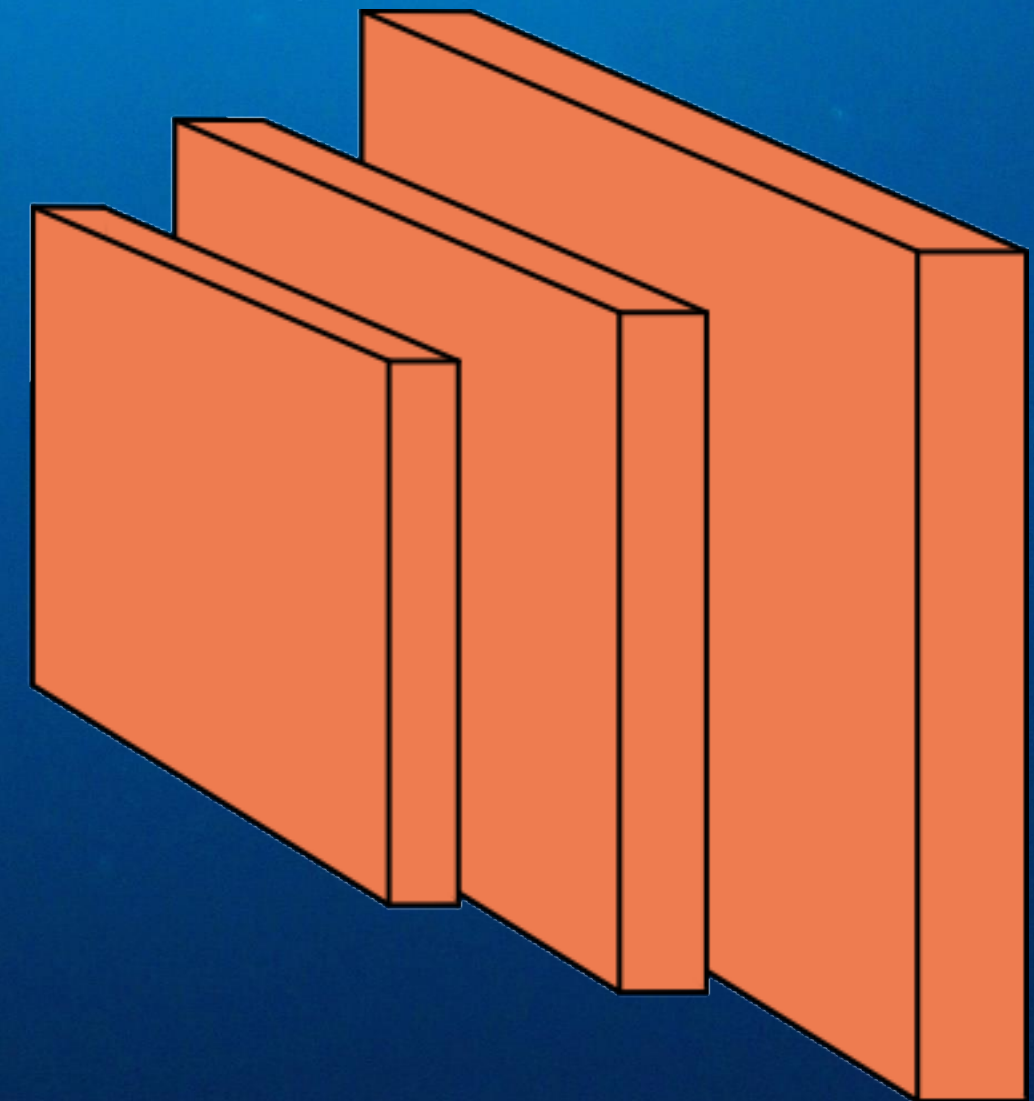
Latent Space

Encoder-Decoder

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



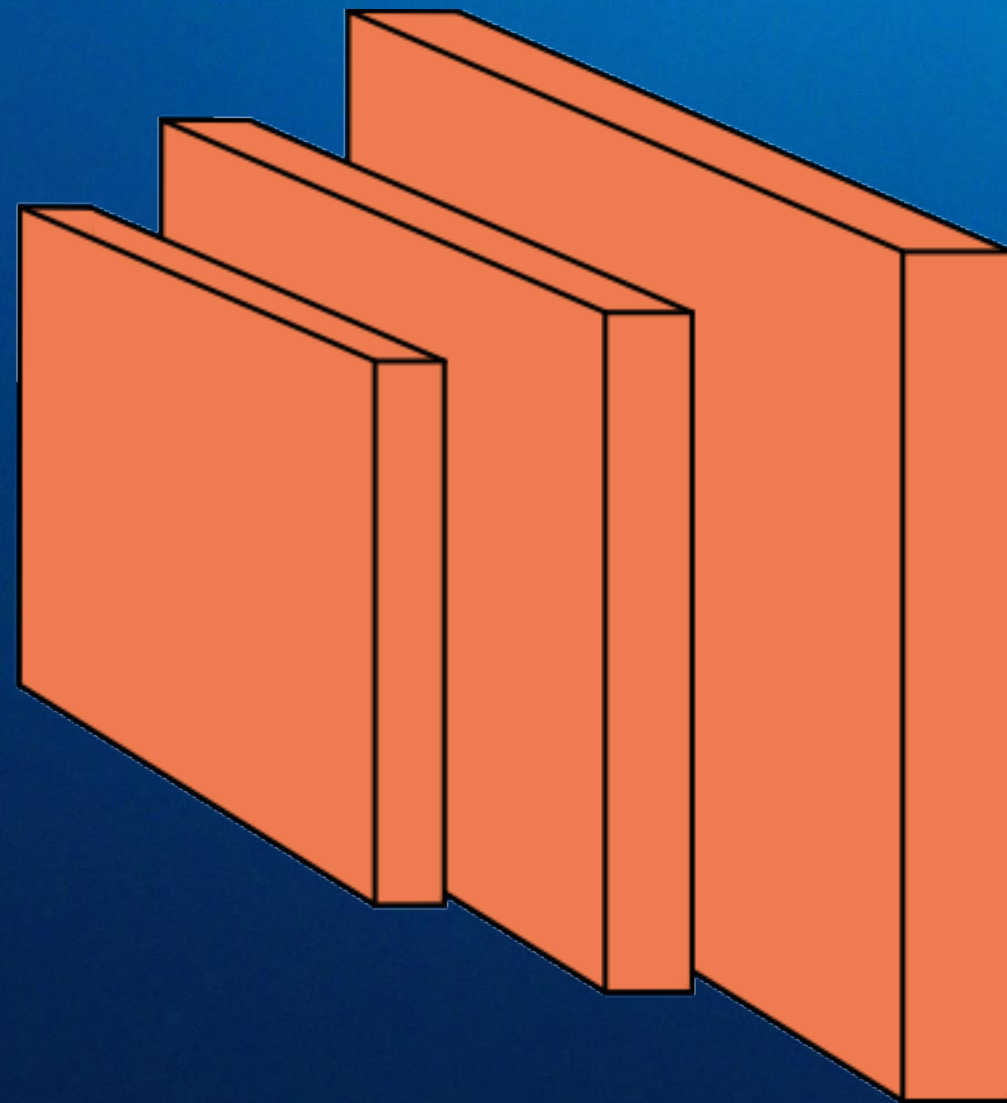
Latent Space



Decoder

Decoder Übersicht

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

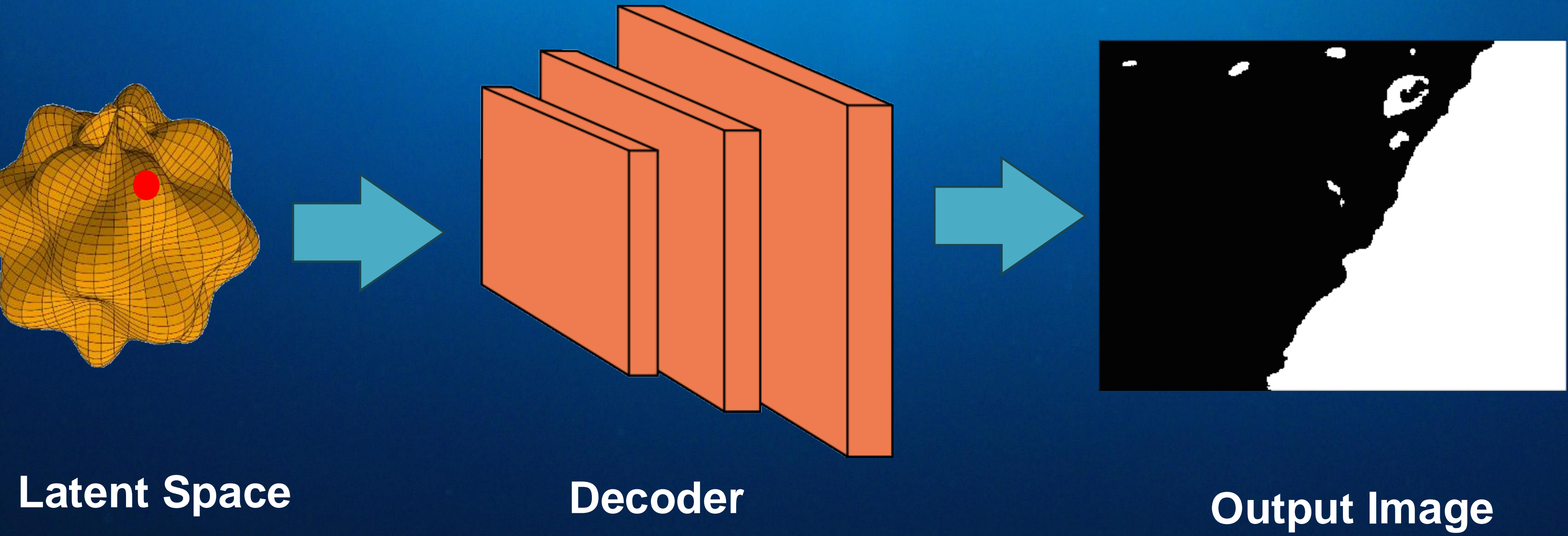


Decoder

- **Rekonstruiert Input**
- **Lernt die Abstrakte Daten zu Interpretieren**
- **Augmentiert gemäss Anwendung**

Encoder-Decoder

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



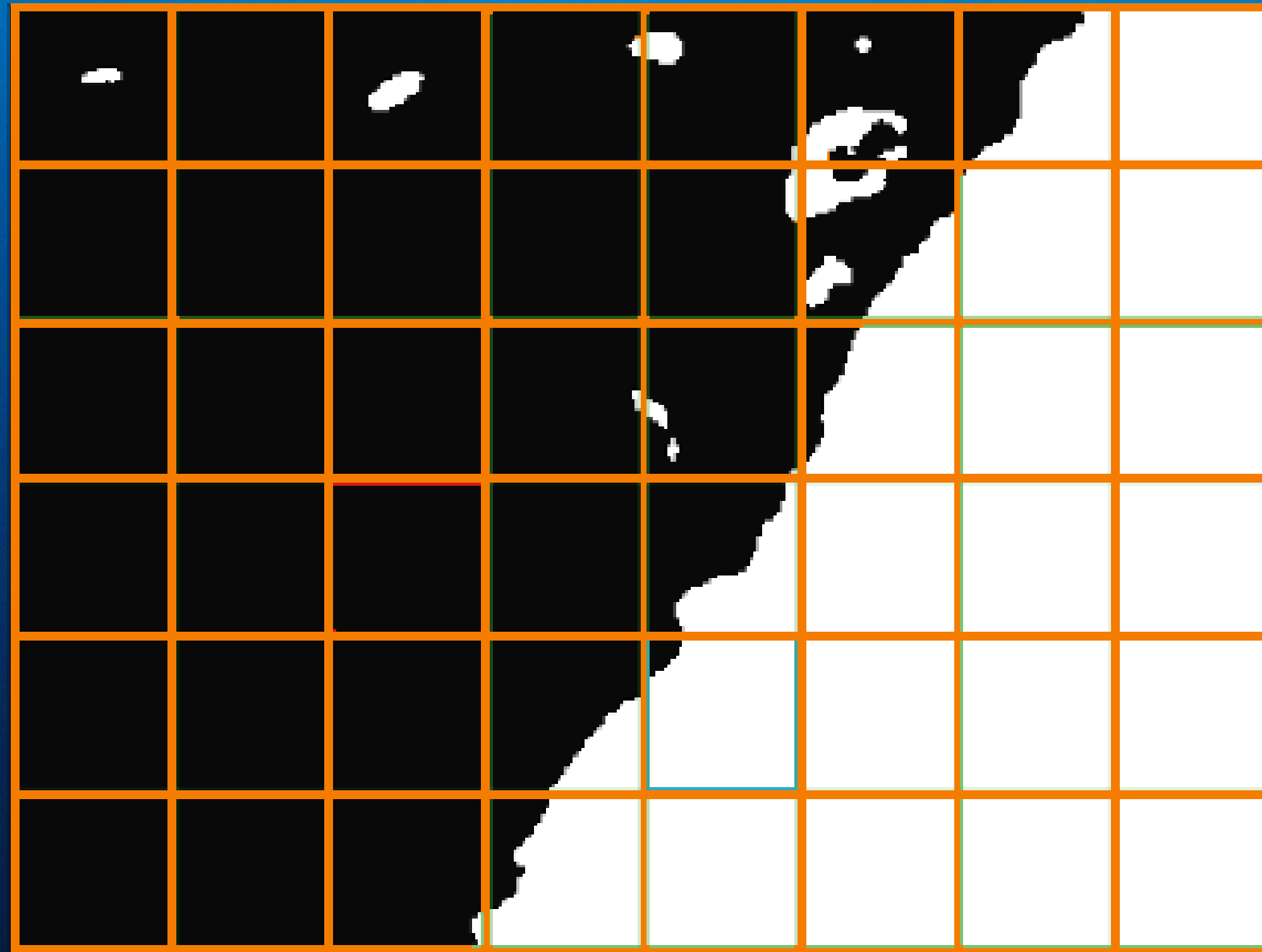
Follow The Gap Methode

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Follow The Gap Methode

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Follow The Gap Methode

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



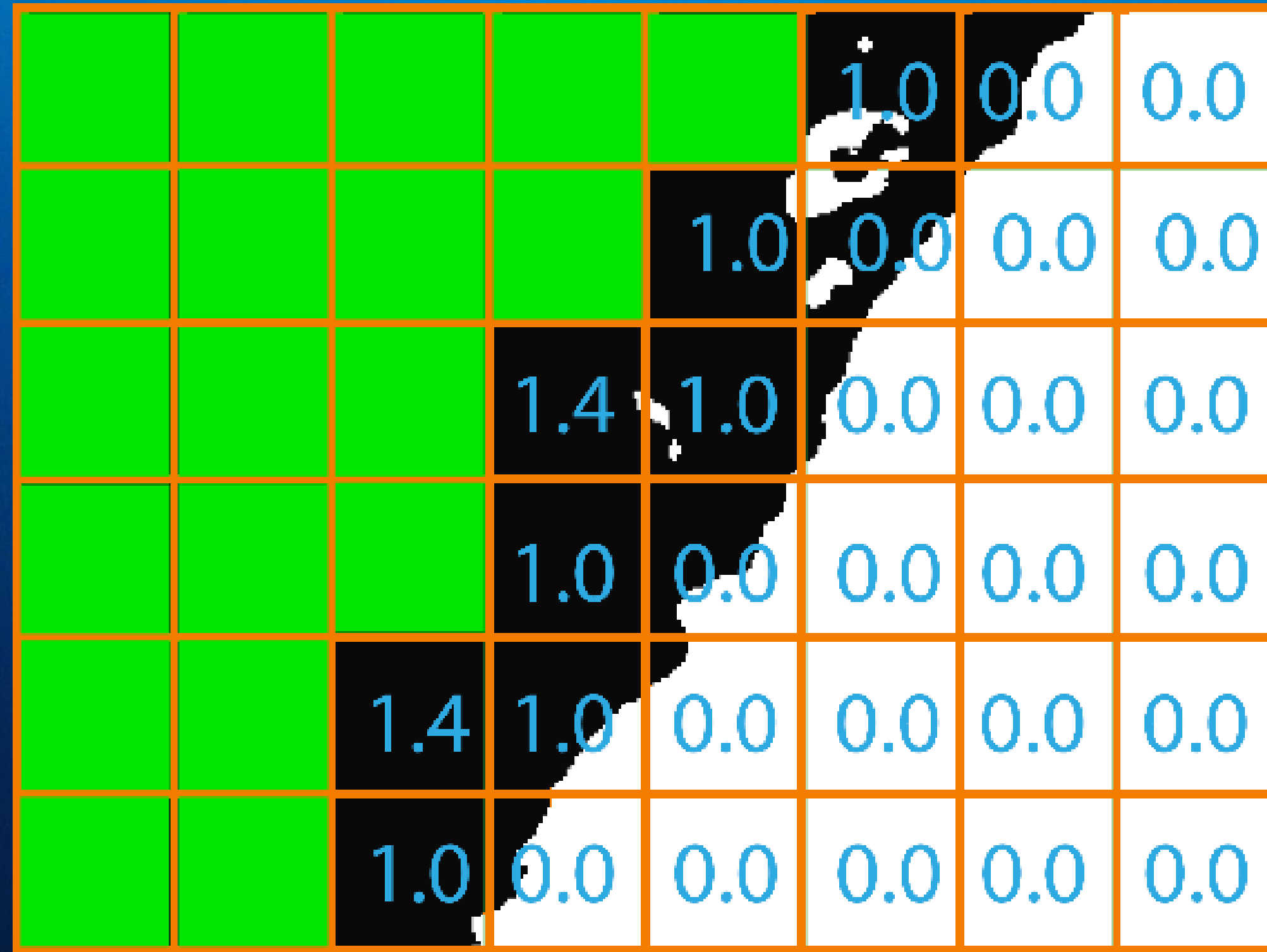
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4.6	3.7	2.3	1.9	1.0	0.0	0.0	0.0
4.1	3.3	2.3	1.4	1.0	0.0	0.0	0.0
3.7	2.7	1.9	1.0	0.0	0.0	0.0	0.0
3.3	2.3	1.4	1.0	0.0	0.0	0.0	0.0
2.9	1.9	1.0	0.0	0.0	0.0	0.0	0.0

Follow The Gap Methode

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



**Kollisionsfreie
Lücken**



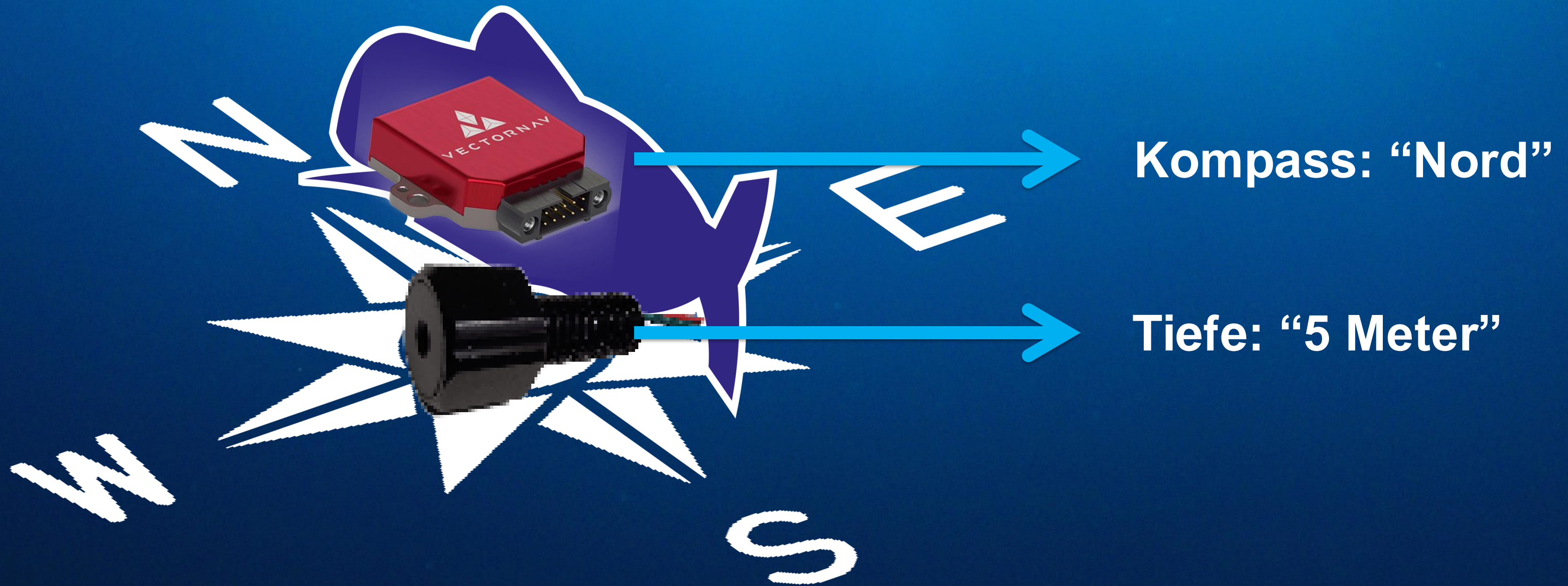
Navigations Ziel

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



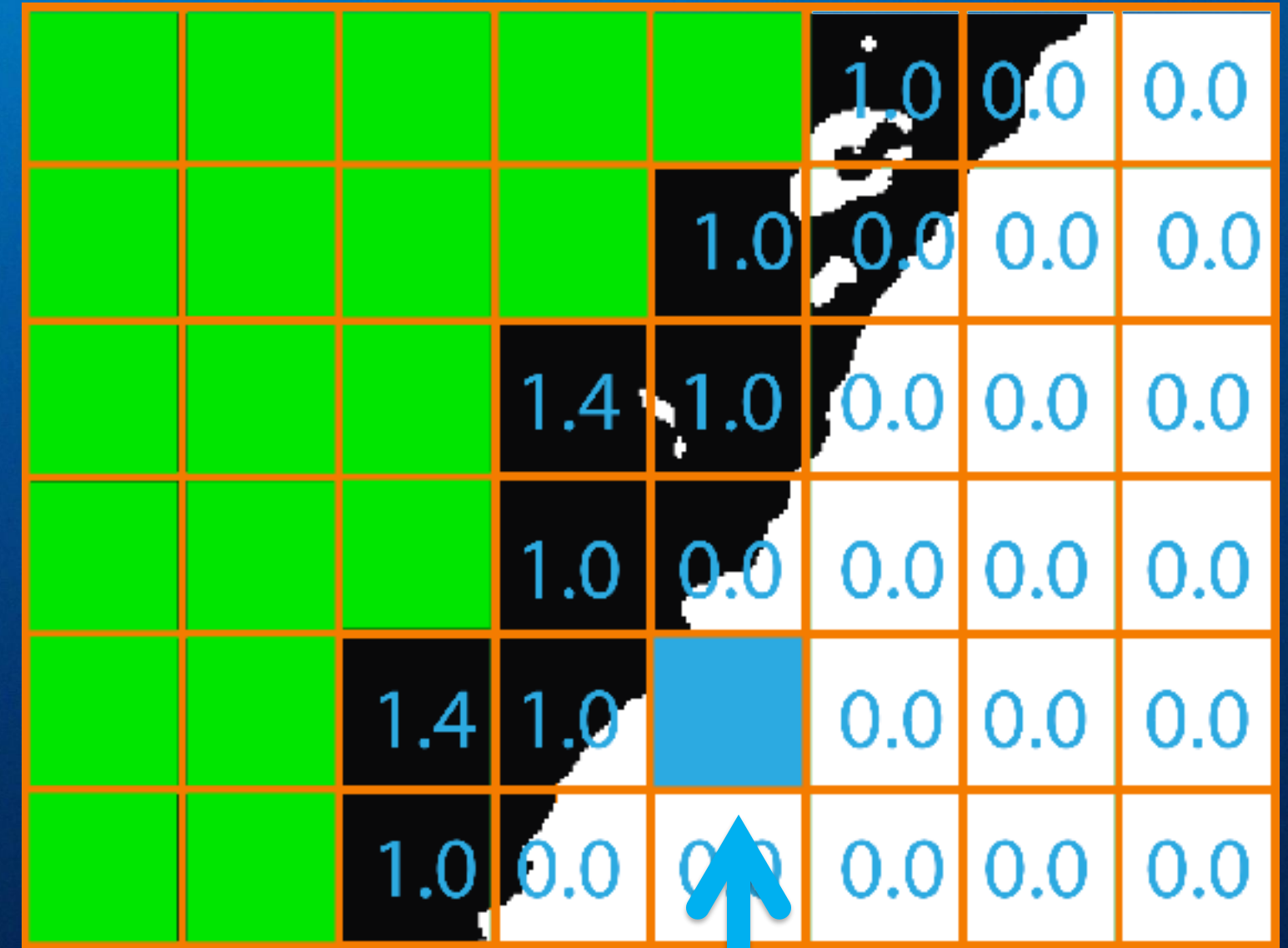
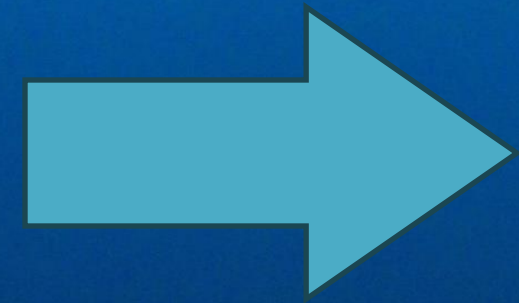
Navigations Ziel

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



Follow The Gap Methode

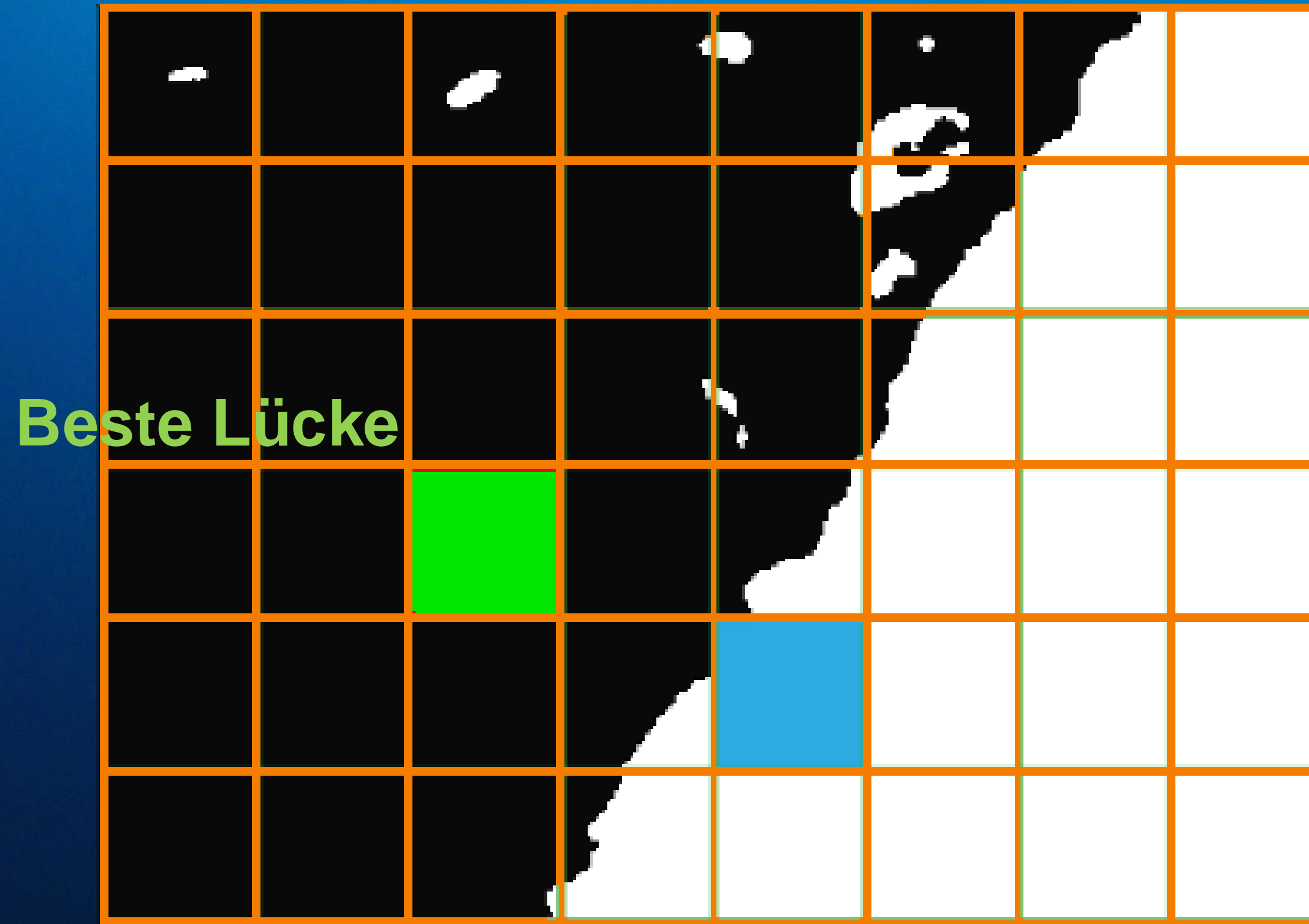
See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



↑
Navigations Ziel

Follow The Gap Methode

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

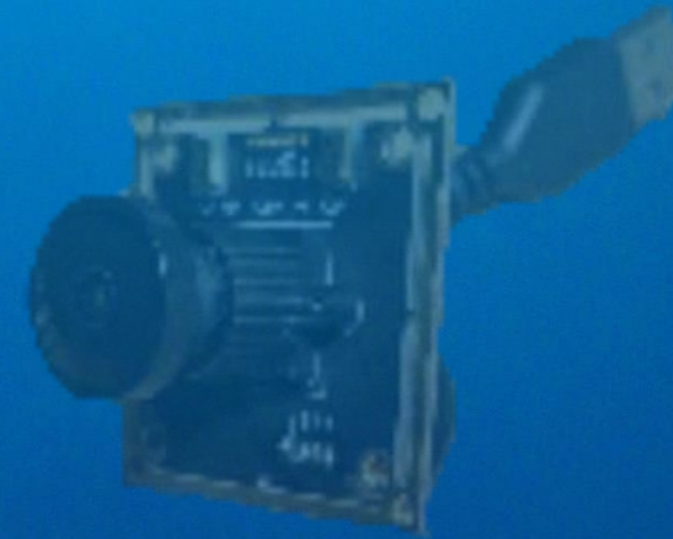


Optische Navigation

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |



- Kamera Basierende Wahrnehmung
- KI Interpretation der Daten
- **Reaktive Steuerung**



Links oder Rechts

Beste Lücke



Steuer Input



Vorhergesagte Kollision

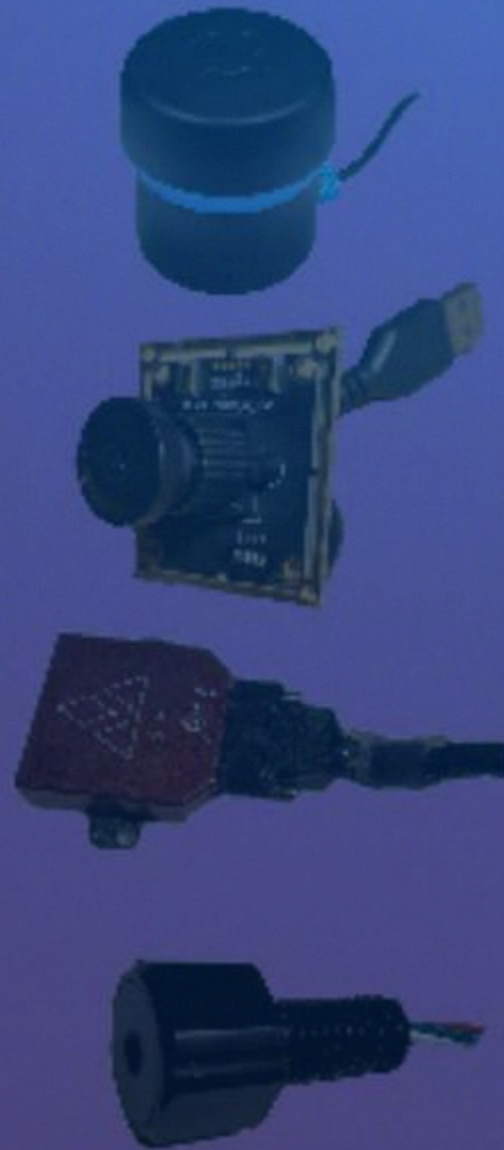




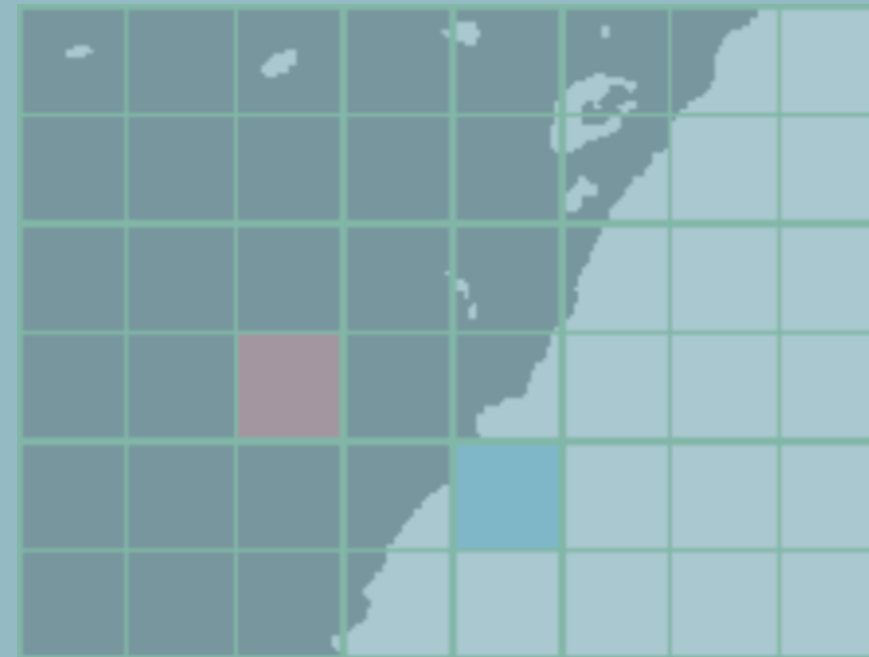
SEE-THINK-ACT Angewandt

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

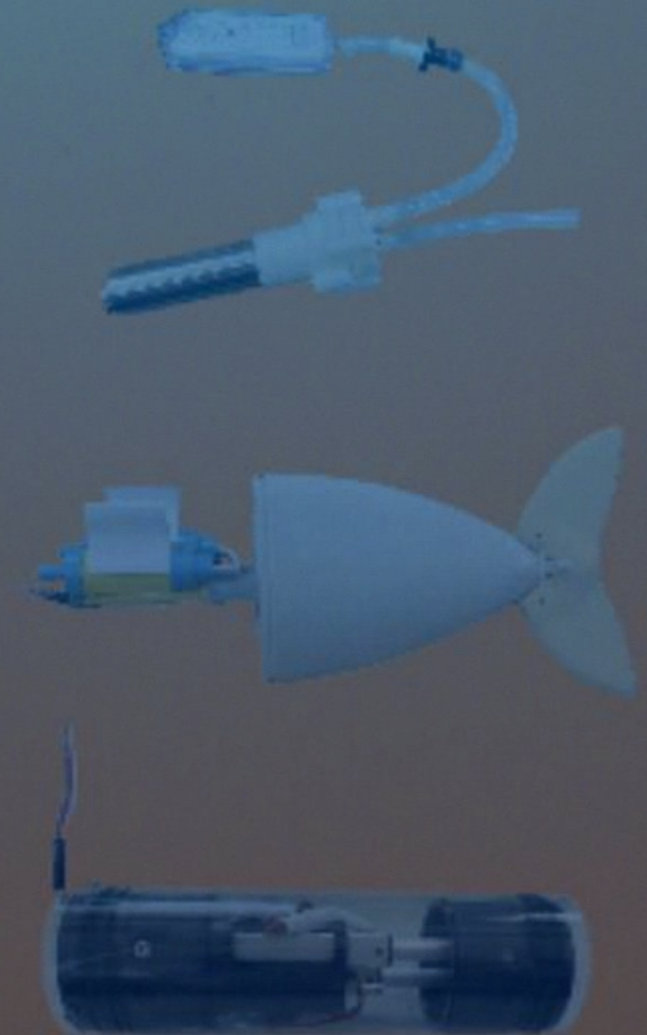
PERCEPTION

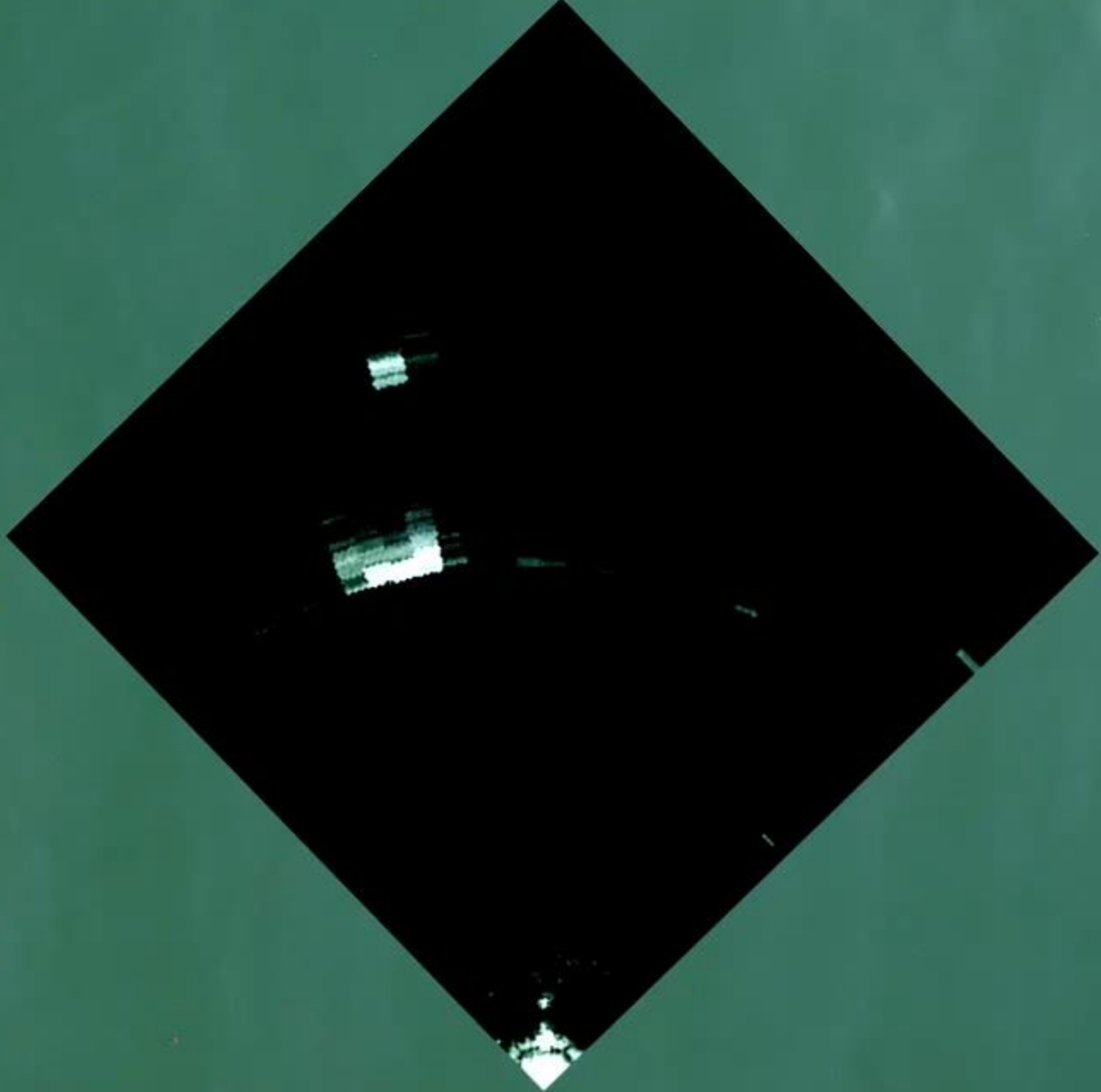
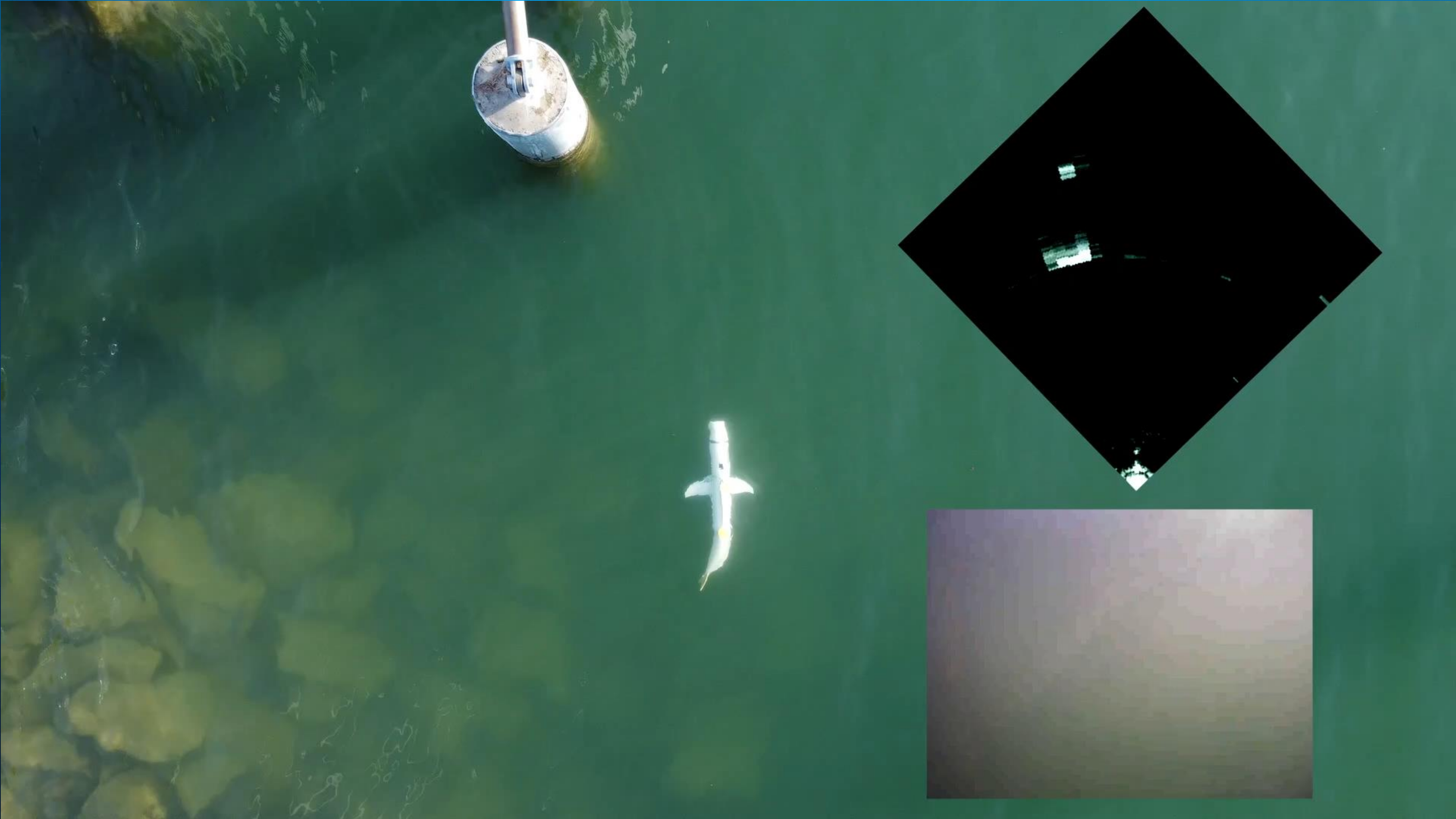


THINK



ACTUATION





Sonar Navigation

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

- **Sonar Basierende Navigierung**



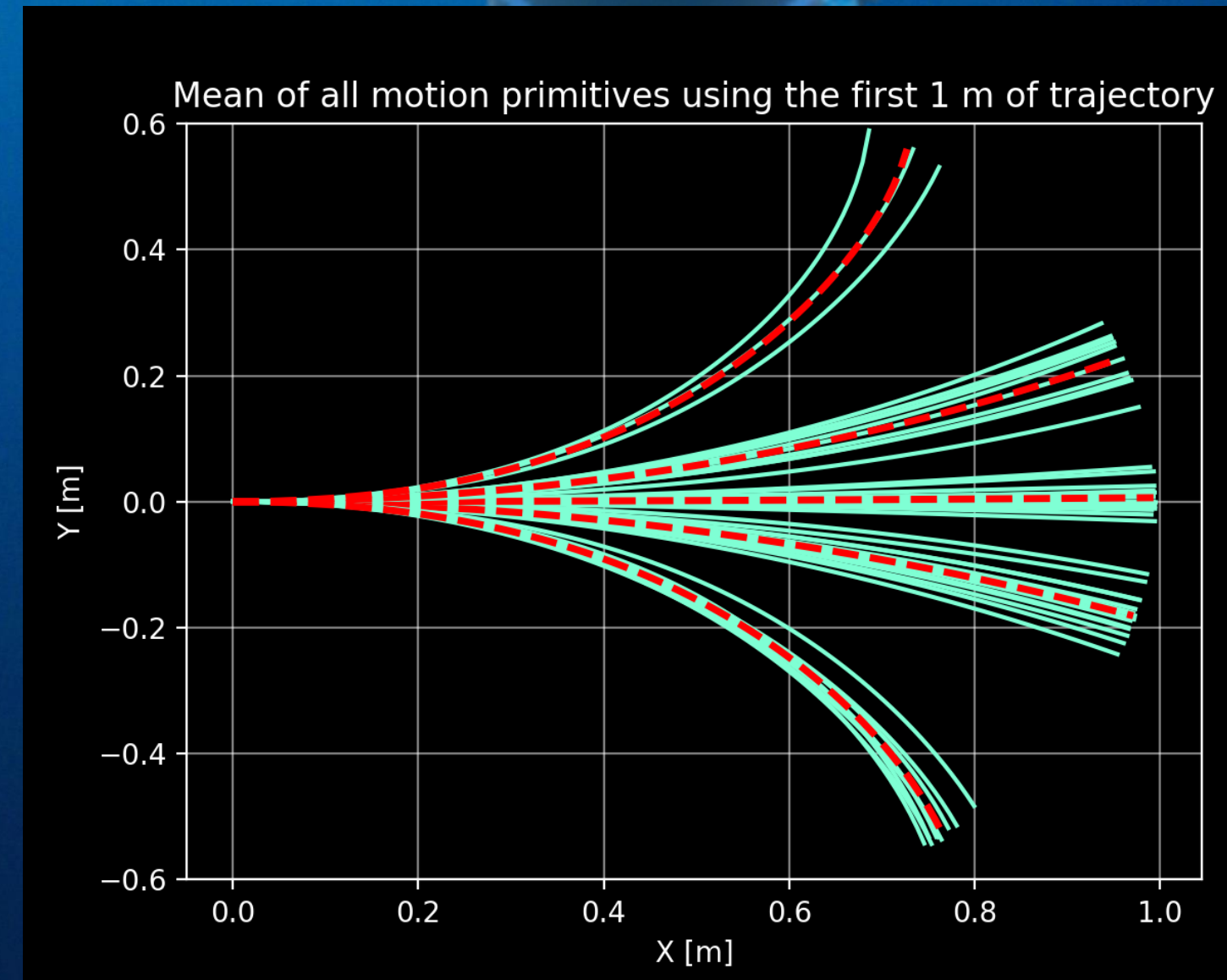
Sonar Navigation

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

SURF-eDNA



- Sonar Basierende Navigation
- **Steuerung Basierend auf Experimentellen Daten**



Sonar Navigation

See-Think-Act | Optische Navigation | Encoder Decoder | Sonar Navigation |

SURF-eDNA



- Sonar Basierende Navigation
- Steuerung Basierend auf Experimentellen Daten
- **Komplexe Trajektorien**

