

Development of an autonomous RC boat

An autonomous boat employs object recognition to avoid collisions

Graduate Candidates



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Introduction: The ICAI (Interdisciplinary Center for Artificial Intelligence) plans a project in which a hydrogen-powered ferry will be developed and operated semiautomatically.

The task is to create an electrically powered model boat as a proof of concept, which can be controlled either via a classic remote control or automatically via an onboard computer. This project aims for the ship to reach a specific coordinate and, in the event of an obstacle, to find a suitable way to avoid it.

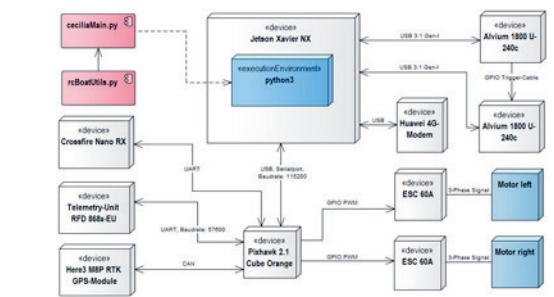
Approach/Technology: To achieve this, a stereo camera system was built, and a Convolutional Neural Network was used to allow the boat to detect and classify objects. For each recognized entity, the Jetson Xavier NX computer runs triangulation calculations and consequently marks danger if too close to the boat.

If an object is indicated as a danger, the ship stops, calculates a possible avoidance route, and tries to overcome the obstacle. While calculating the avoidance path, the coordinates of the detected object are also computed, allowing the collection of data in each mission and the creation of a heat map, showing the location of persistent dangers.

Conclusion: A remote-controlled boat has been built from scratch, and an autonomous driving algorithm was programmed. A Jetson Xavier NX on board the boat performs all necessary calculations for inference, triangulation, and calculation of new pathways. A PixHawk Cube Orange is installed as the main flight controller to control the motors and provide information such as the vessel's position, speed, and heading. The two devices are connected via a serial

port and work closely together. Very long missions are also possible thanks to the 4G connection on the boat, which allows it to be reached even at great distances.

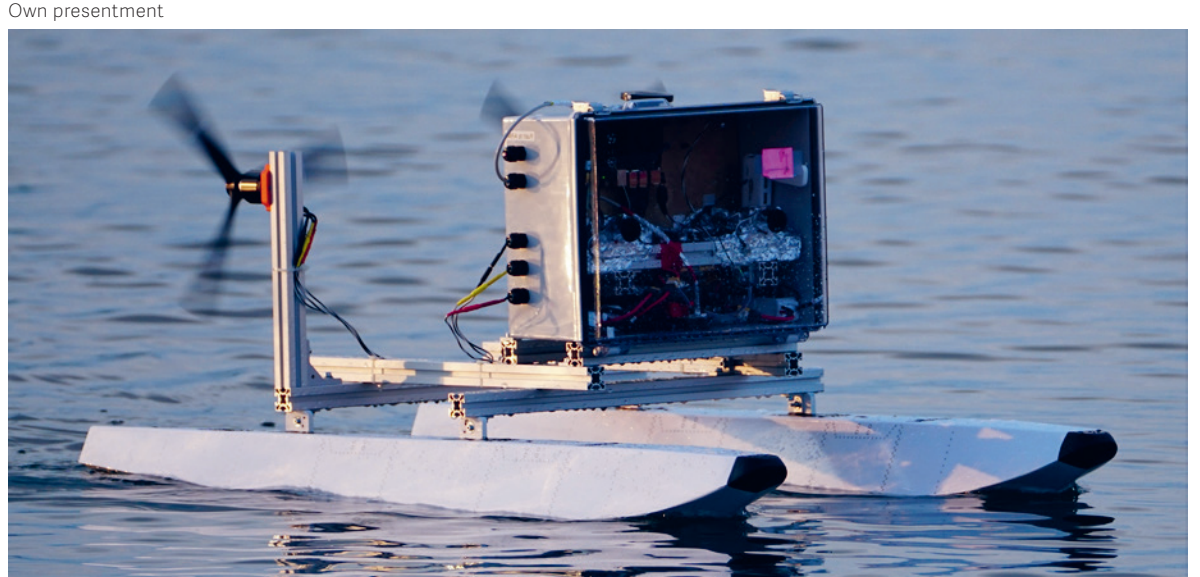
Block diagram of the main components used on board the boat.



How the boat sees the world. Green: buoy not in the way, free to go. Red: buoy in the way, obstacle.



Cecilia (the boat), cruising on the Obersee during a nice sunset.



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Subject Area
Artificial Intelligence

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