

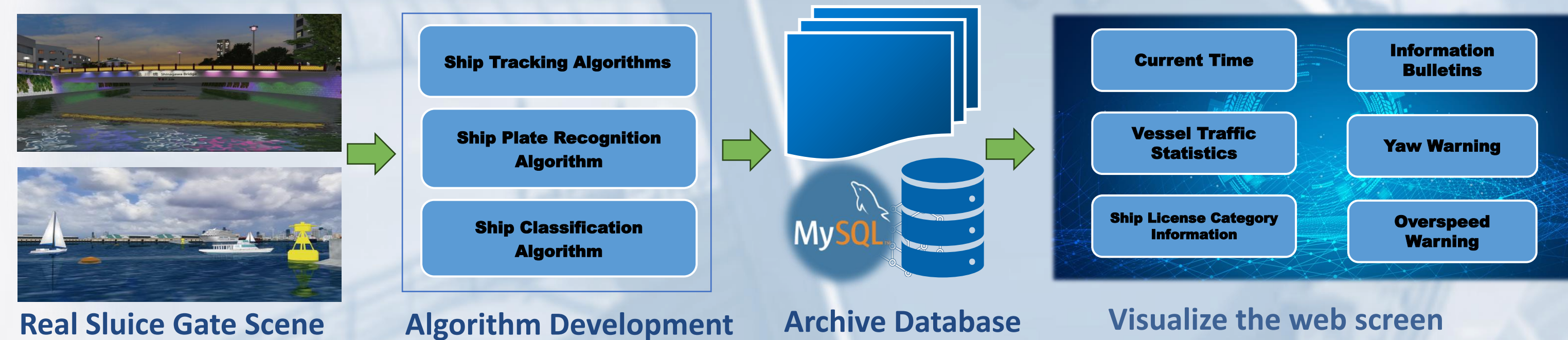
Digital Twin Sluice Management System

Background & Significance

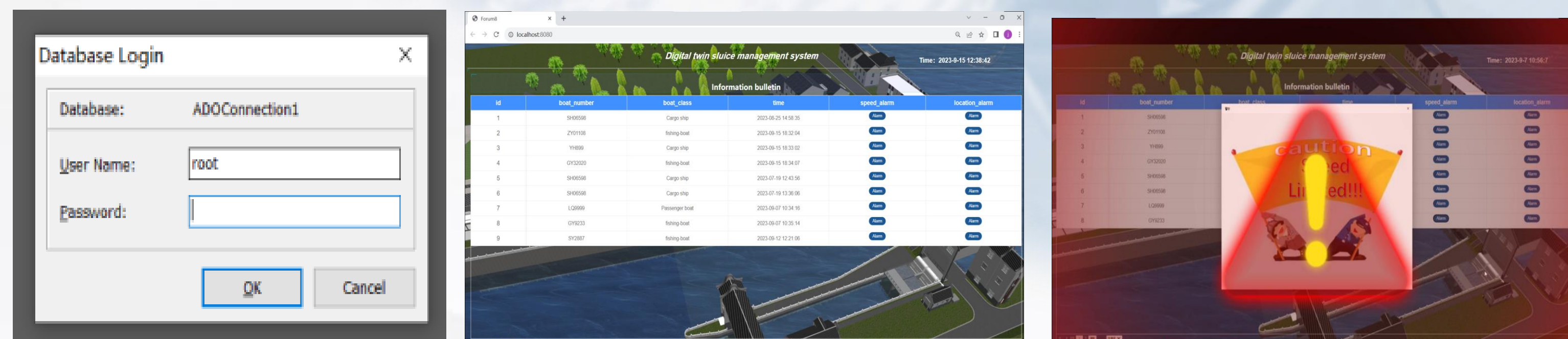
In recent years, the occurrence of water traffic accidents is common, including the collision of two ships, capsizing and other phenomena, the main reasons are insufficient surface supervision, large ship flow, improper operation of the driver, and the water is not calm so that the ship deviates from the course etc. To improve the safety of water navigation and facilitate ship management, we established the digital twin sluice management system according to the real-time scenario to monitor the running state of the water surface in real-time, to decrease the occurrence of water traffic accidents, which has great significance for the future water surface management.

System Architecture & Algorithm

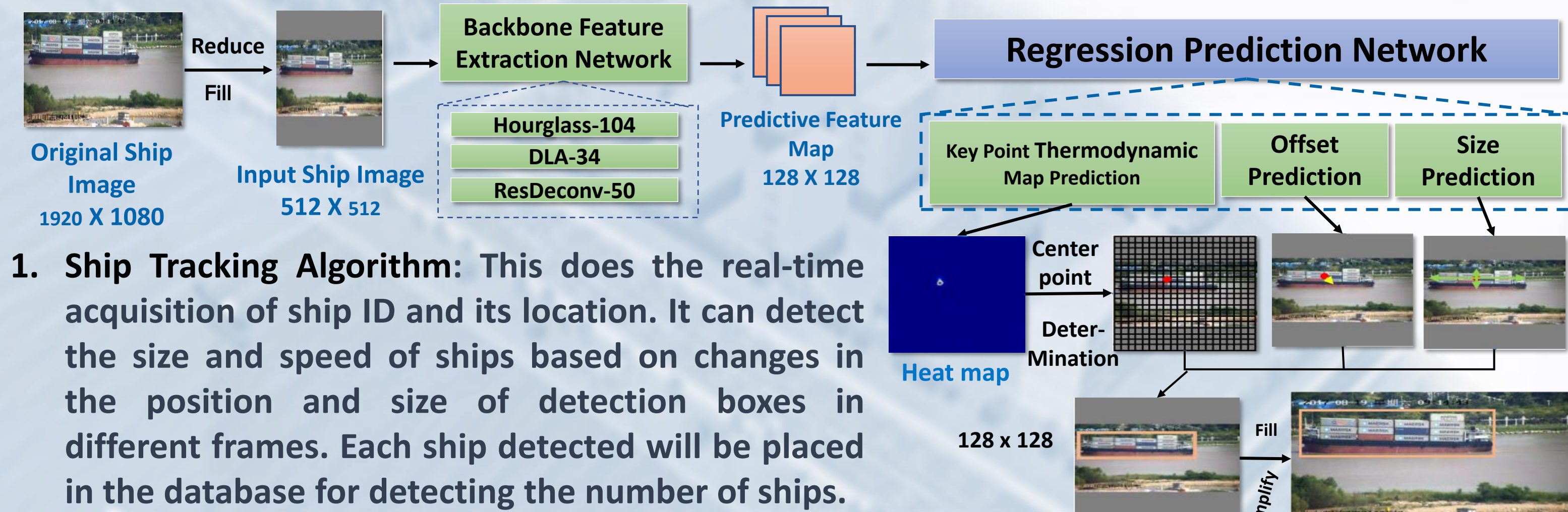
Digital twin sluice management system uses algorithms such as ship tracking, ship license recognition and ship classification to build twin sluice gates in UC-win/Road software and import rich ship models to twinned ship operating status in real scenarios, and monitor the operating status, performance and operating parameters through a large visual screen. At the same time, in order to ensure safety, ship will display warning information on large screen to remind the driver.



We use different types of algorithms to get different types of boat information. The paddleOCR algorithm identifies the boat number for license information. The EfficientNet algorithm is used to classify ships category. The yolov5 algorithm to track the boat position. The results of each algorithm are saved into the MySQL database. The UC-win/Road is connected with the database through ODBC+ADO. In order to access all the algorithm results, at first user needs to enter the valid username and password of the database and run the desired scenario. Then the user can see the ship information displayed on the large screen, including the boat's license plate, the class of the boat and the time the boat passed the gate. When the speed of the ship is detected, the console will sound an alarm to remind the driver to slow down.

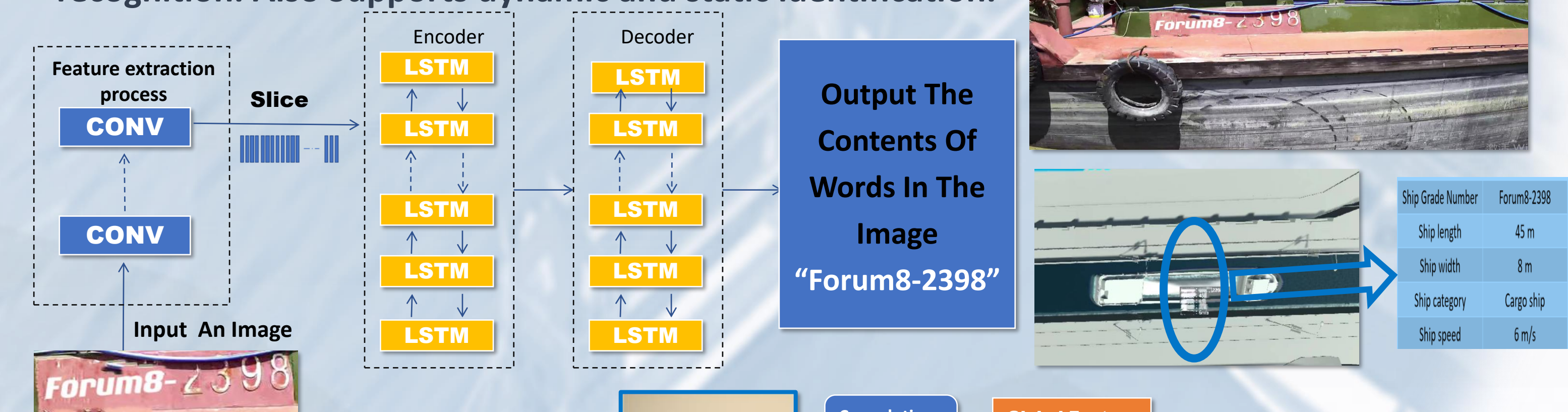


Algorithms



1. **Ship Tracking Algorithm:** This does the real-time acquisition of ship ID and its location. It can detect the size and speed of ships based on changes in the position and size of detection boxes in different frames. Each ship detected will be placed in the database for detecting the number of ships.

2. **Ship Plate Recognition Algorithm:** This includes a multilingual recognition model and supports complex ship nameplate recognition. Also Supports dynamic and static identification.



3. **Ship Classification Algorithm:** This algorithm network has the dual advantages of network size and recognition accuracy and can complete classification tasks in almost real-time.

Angel Navigation

