DETECTION OF SHIP PATHS ON DOCKING AND QUAY OCCUPATION ANALYSIS BASED ON A VIDEO-IMAGERY SYSTEM AS SUPPORT TO PORT MANAGEMENT

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Why do we develop this system? Because...
1. The system is as a tool that can help to improve port economic and operative management. In particular, Dock occupation level is basic information to:
   - Determine the dock’s occupation density by the ships and, then, to obtain dock’s occupation probability.
   - Risk calculation according to Puertos del Estado (2001), which establishes the probability as the basis for the design, maintenance and exploitation of port facilities.
2. Port Authorities must apply fares to ships and terminal operators based on these parameters.
3. Nowadays there is not an automated and/or objective protocol to determine these parameters.

Is there a need of additional investment in the infrastructure to support this system?
With this technique there is not need of additional infrastructure investments because it profits of already existent communication infrastructure dedicated to:
- Access control
- Security surveillance

Laboratory experiments I:
- Quay occupation percentage evolution
  - 3 Ship sizes: 0.25 m, 0.5 m, 1 m
  - 3 m long mooring line
  - No needed because observation is zenithal and close to the object (Cam 1)

Laboratory experiments II:
- Ship’s paths registration
  - No needed because the chosen observation is zenithal view and close to the object (Cam 1)

Methodology
- Acquisition system configuration
- Video - recordings setup
- Distortion correction
- Image restitution
- Video-processing algorithm application
- Basic parameter subtraction
- Information

Experimental results
- Ship paths corresponding to several approximations
  - Quay percentage evolution
  - Occupation percentage evolution

Conclusions
1. The quay management strategies may be based on the real traffic of the quay and not on year-averaged ratios.
2. The evolution of the occupation percentage of a quay can be obtained through time-stack techniques.
3. It is possible to monitor ships’ paths and to obtain the trajectories’ envelope through video-processing algorithms.
4. The analysis of trajectories envelope allows determining the areas with high and low traffic. This allows knowing which are the areas where an accident is more likely to occur.
5. Video - monitoring techniques can be used to calibrate actual ship manoeuvre tools because they provide them empirical data of ship movements.
6. The video-processing algorithms are being developed continuously. Thus, it is necessary to adapt them to port management and operation field.
7. A combination of motion-detection and time-stack techniques leads to a quantitative measure of port operation parameters. This fact leads to a better management of port areas.

Main references

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Puertos del Estado