Maritime collision avoidance – Safety index model

Fredrik Olindersson
Department of Shipping and Marine Technology
2016-12-16
Collision avoidance in different areas

Comparison of collision avoidance prerequisites in road traffic, aviation and maritime traffic

Road
- 2D
- Clear intersections
- Easier to slow down
- Easy to stop
- All traffic in the same area

Aviation
- 3D
- Fuzzy intersections
- Easier to change course or altitude
- Impossible to stop
- Separation of non-professional traffic

Maritime
- 2D
- Fuzzy intersections
- Easier to change course
- Hard to stop
- All traffic in the same area
Common international regulation

Convention on the international regulations for preventing collisions at sea (COLREG), 1972

- Defining which vessel in a situation that is
  - Give way vessel – responsible for avoiding manoeuver
  - Stand on vessel – keep course and speed
Factors affecting the steering rules

Visibility, area, navigational status and type of situation

- In sight
- Open sea
- Power-driven
- Constraint of draught
- Restricted visibility
- Narrow channels
- Sailing
- Restricted ability to manoeuvre
- TSS
- Fishing
- Not under command
- Head-on
- Crossing
- Overtaking
Identification of situation

Means to identify the situation

- Visually
- Radar
- Automatic Identification System (AIS) – transponder system
Risk of collision

Main parameters to measure

- Closest Point of Approach (CPA)
- Time to CPA
- Bow Cross Range (BCR)
- Time to BCR (BCT)
Risk of collision

Also depends on…

- Shown intentions
- Traffic pattern compliance
- Environment
Sea Traffic Management

Exchange of information ship-to-ship and ship-to-shore

- Route exchange
- Route cross-check and optimization
- Flow management
- Area management
- Navigational assistance

- Traffic monitoring
- Search and rescue
- Ice navigation

www.stmvalidation.eu

Safer shipping or not?
Safety index

How safe is the situation?

- Model to measure safety index based on
  - Geometric risk (CPA, TCPA, BCR, BCT, Ships’ length etc.)
  - Intentions and colreg compliance
  - Traffic pattern compliance
  - Environment

- Data from navigational simulators or AIS data
Future

The safety index model could be used to:

- Instantaneously follow safety index in simulator exercises to identify safe and unsafe behaviour
- Compare traffic safety in an area before and after changes of regulation
- Decision support for collision avoidance
- …