I The problem of communication for autonomous vessels

1. Steps towards safe unmanned shipping
   1. Why autonomous and unmanned shipping
   2. Ongoing projects
   3. Stakeholders
   4. Challenges when combining unmanned and manned vessel
2. Decision model for safe operation
   1. Decision process
   2. External factors

What is autonomous, unmanned, remote, etc. Define what I’m going to use, and why

Push factors for unmanned, name projects

Pull factors for unmanned, reasons why people want to pay for unmanned

Challenges with autonomous

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Challenge I’m going to tackle

Decision process (?)

Research questions

II Effect of manoeuvrability on decision making

1. Decision making process
   1. Decision phases
   2. Nodes in decision making tree
   3. Critical paths in decision trees
2. Identification of situation and scenarios
   1. Situation identification
   2. Situations that limit possible strategies
   3. Scenarios
3. Definition of criteria for evaluation of situation
   1. Calculations based on current systems
   2. Proposed algorithm based on planned path
4. Manoeuvres for tool validation and testing
   1. Manoeuvre descriptions
   2. Tool validation
5. Evaluation of critical evasive manoeuvre
   1. Trial results for critical evasive manoeuvre
   2. Use case
   3. Effect of advance distance on decision and design process
6. Conclusion

Explain what I’m going to look into and develop

Present the decision making process, and that steps are taken to

Explain use case which is used as example

How to identify situation

What situation is use case,

Definition of criteria with simplified calculation

why is use case critical

Explain sea-trials and manoeuvring characteristics

Results of chosen strategy for specific use case

Generalized result for strategy

Conclusion, why does this method work

Next manoeuvres to be tested

Explain it is not always possible, thus communication is necessary

III Necessity of a protocol to enable teamwork between manned and unmanned ships

1. Foundation
   1. Operational demands
   2. Human factors
   3. Envisioned technology
2. System design specification
   1. Design scenarios
   2. Functional requirements and claims
   3. Use case
   4. Ontology
3. Design evaluation
   1. Evaluation method
   2. Evaluation results
   3. Conclusions based on experiment
4. Conclusion

Repeat reasons why communication is necessary

Research questions

Why existing systems

What is role of human

Requirements

Used technologies

Ontology examples

Evaluation method

Do experiment

Results of evaluation

Lessons learned from experiment

Conclusion about protocol

The next steps

IV Wrap-up

1. Final conclusion and recommendations
   1. Impact of manoeuvrability on sailing without communication
   2. Development of a protocol based on existing systems
   3. Combining previous results
   4. Recommendations for future research

Summary part 1

Summary part 2

Summary part 3

Will the combination of these two solutions solve the challenge of communication?

It looks so, but we have to pay attention to this.

With all my student collegeuas in the room, I challenge you to

V Appendices

1. Current systems for safe navigation
2. Simulation environment
3. Accidents