

Article Presentation

A Robot Application for Marine Vessel Inspection

Mateus Santos de Cerqueira

SENAI

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INTRODUCTION



Figure: Traditional Inspection Methods

- Overview

Traditional Inspection

MINOAS

Spatial Content Management System (SCMS)

REENGINEERED INSPECTION PROCEDURE

System	Stage 1	Stage 2	Stage 3
Aerial platform		x	
Lightweight inspection system (crawler & localization device)			x
Heavyweight inspection system (crawler & NDT thickness measurement device)			x
Defect detection system	x		x
Spatial contents management system	x	x	x

Figure: Relation Between Systems and Inspection Stages

MINOAS Inspector Platforms

Laser Scan

IMU

SLAM

Infrared or Ultrasound sensor



Figure: Aerial Vehicle

Aerial Inpection Robot

Aerial Inspection Robot For Stage 1

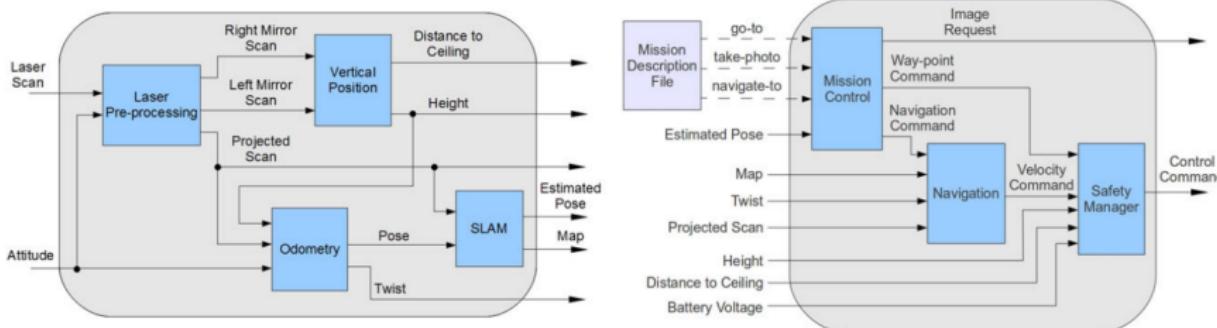


Figure: Self-Localization, Mapping and Mission Execution Modules

Lightweight Inspection Robot

Lightweight Inspection Robot For Stage 2

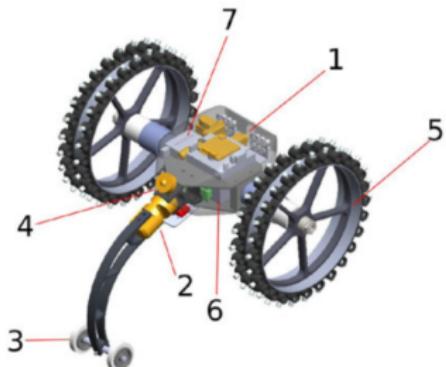


Figure: The Lightweight Crawler

Lightweight Inspection Robot

Lightweight Inspection Robot For Stage 2

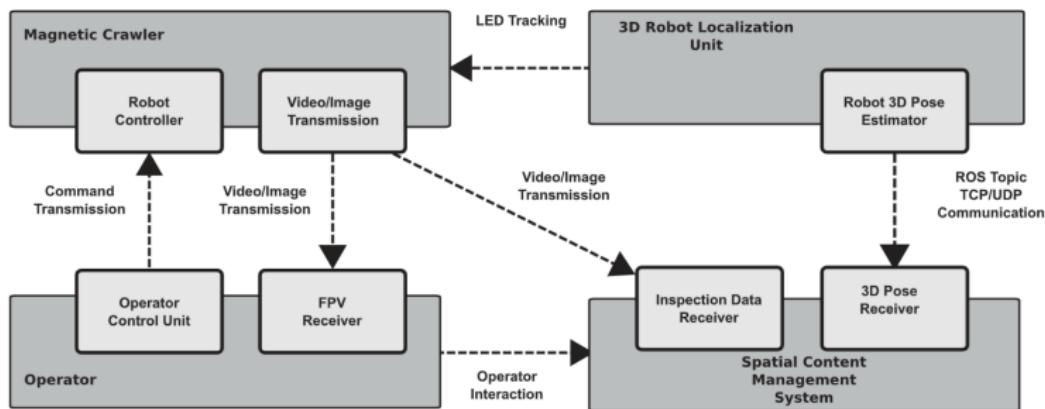


Figure: Control Software of the Lightweight System

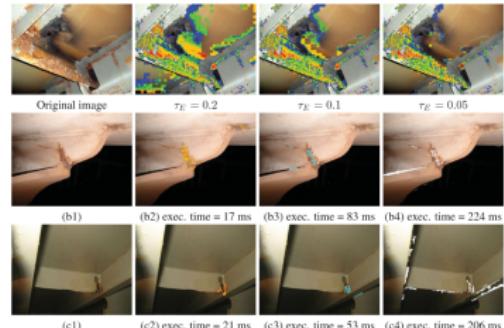
Heavyweight Inspection Robot



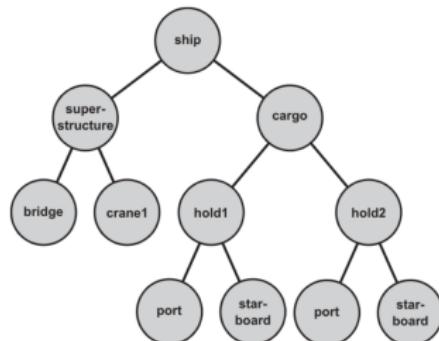
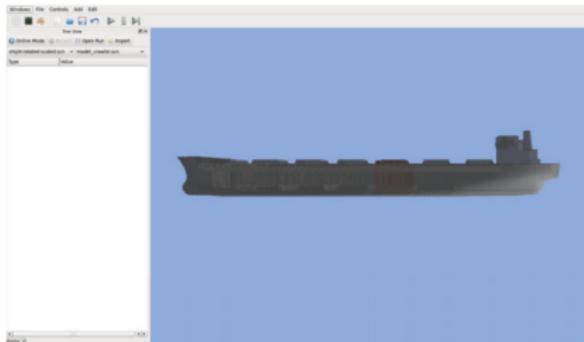
Figure: MARC Rear Wheel Configurations

A Vision-Based Solution for Defect Detection

- Corrosion Detection;
Roughness is measured
Color information
- Crack Detection;
 $N \times N$ pixel
 $M \times M$ pixel



Spatial Content Management System for Robot-Acquired Inspection Data



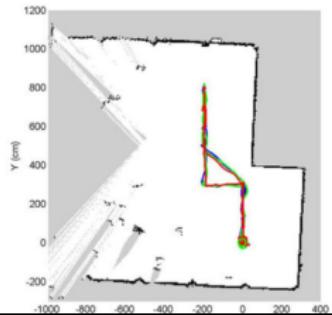
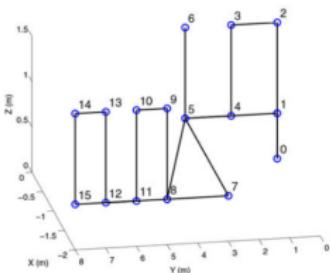
- SCMS Data;
Collecting
Sharing
Displaying

System Performance Evaluation

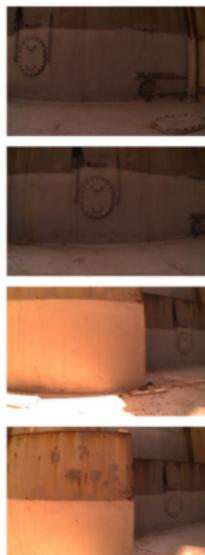
Micro-aerial vehicle (MAV)



(b)



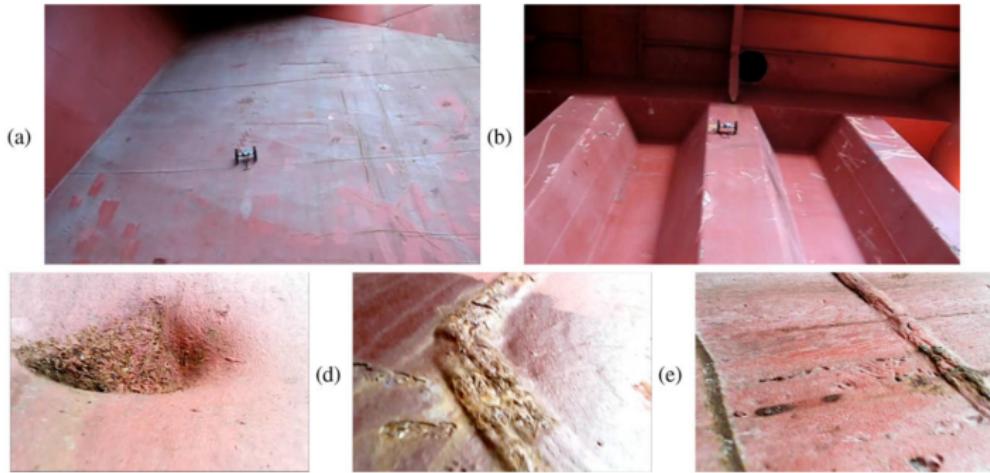
(d)



(e)

System Performance Evaluation

Lightweight Crawler



System Performance Evaluation

Heavyweight



CONCLUSION AND FUTURE RESEARCH

Thanks

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Thanks