











Motivation

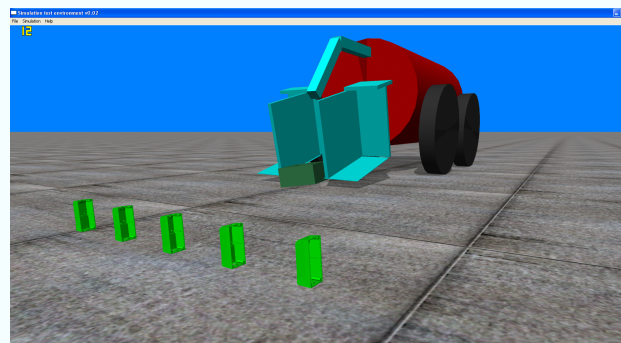
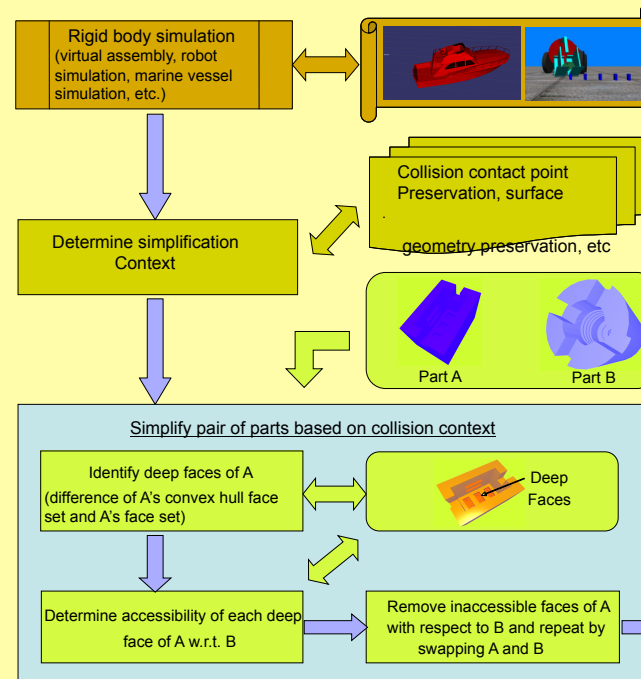
- Interactive rigid body simulation is used in many applications
 - VE based applications like assembly process training, Explosive Ordnance Disposal (EOD) robot training, etc.
 - Simulation based automatic discovery of robot dynamics and controller design
- Detailed CAD models slow down the rigid body dynamics simulation and interactive speeds cannot be achieved
- Model simplification schemes used for graphics rendering is not suitable for rigid body dynamics simulation as collision contact points are altered
- Simulation context based model simplification is needed that can preserve the physics

Preliminary Results

Model Pair		Unsimplified Facet Count		Simplified Facet Count	
A	B	A	B	A	B
		6334	44	5749	26
		1806	44	890	26
		800	44	544	26
		1882	44	1756	26
		428	44	190	26

Number of facets reduced after the simplification ranges from 6 to 55% depending on part complexity

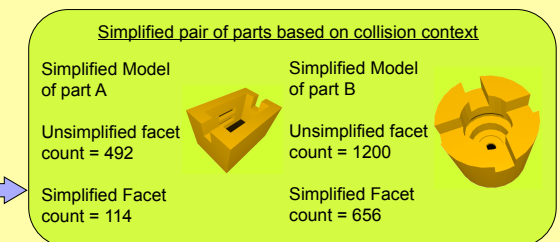
Approach



Improvement in frame rates in the visualization during dynamics simulation (using Open Dynamics Engine) was found to be 35% in our tests

Objectives

- Identify the main characteristics of the rigid body dynamics affecting the simulation time and results to generate simplification contexts
- Identify a suitable canonical geometric representation to enable model simplification
- Simplify model using the identified context and measure the accuracy of simulation using simplified models
- Develop a computational framework for optimizing the simplification process



Future Research

- Simplification context in marine vessel dynamics simulation is ocean wave interaction
 - The surface geometry exposed to the wave velocity field must be preserved
- This simplification will reduce simulation time leading to meta-modeling of dynamics which can be used for determining high fidelity real time response of marine vessels
- Meta models will be helpful in realizing simulation based discovery of navigation and control strategies