



DERIVE and Linear Algebra

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Learning based on Competences

Generic:

- Self-learning
- Critical thinking
- Teamwork
- Problem solving
- Use of technology

Specific:

The use of Linear Algebra concepts to solve engineering problems



Learning Goals

- Self learning for using DERIVE
- Autonomous team work with DERIVE
- Capacity to apply knowledge and skills of Linear Algebra for problems solving



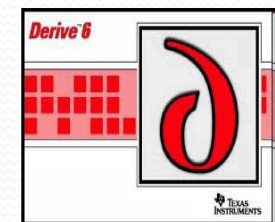
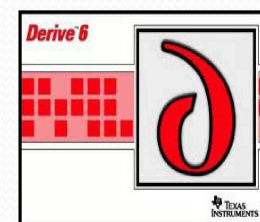
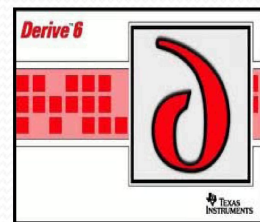
Experiment: DERIVE files for Linear Algebra

- Tutorials are provided together with exercises and problems proposed
- The students (**teams of 2-3 people**) worked with the tutorials and solved the exercises and problems
- 12 groups (around 30 people)
- An enquiry is proposed for evaluation purposes



Example: Orthogonal transformations

- 5 tutorials: 2 rotations and 3 reflections (in the plane and in the space)
- Around 20 exercises (4 for tutorial)
- The tutorials are the basis for a practical session in Linear Algebra.
- Feeling of students





Satisfaction Survey

Average of results: **1= NO, 2=POOR, 3= QUITE 4= VERY MUCH**

ITEMS	D1: Rot2	D2:Ref2	D3:Rot3	D4: Ref1-3	D5: Rfe23
Easy to work with the files	3.7	3.7	3.3	3.5	3.4
Useful of defined functions	3.9	3.9	3.7	3.9	3.8
Useful for understanding concepts	3.6	3.5	3.3	3.2	3.4
The exercises are affordable	3.5	3.4	2.8	3	3.2
Useful for solving problems	3.6	3.6	3.2	3.5	3.5
Suitable for exams	3.1	3.2	3.1	3.1	3.2
Improving the competence Self-learning	3.3	3.5	3.6	3.5	3.5
Improving the competence Teamwork	3.6	3.6	3.5	3.5	3.6



The competition

- Addressed to more interested students
- Modeling a real problem related with orthogonal transformations.
- Use of DERIVE and Linear Algebra concepts for solving the problem



The winner project: *Optimal and automatic process for container unloading* by Jordi Vila

Design and implement a tool to automatically unload a container ship.



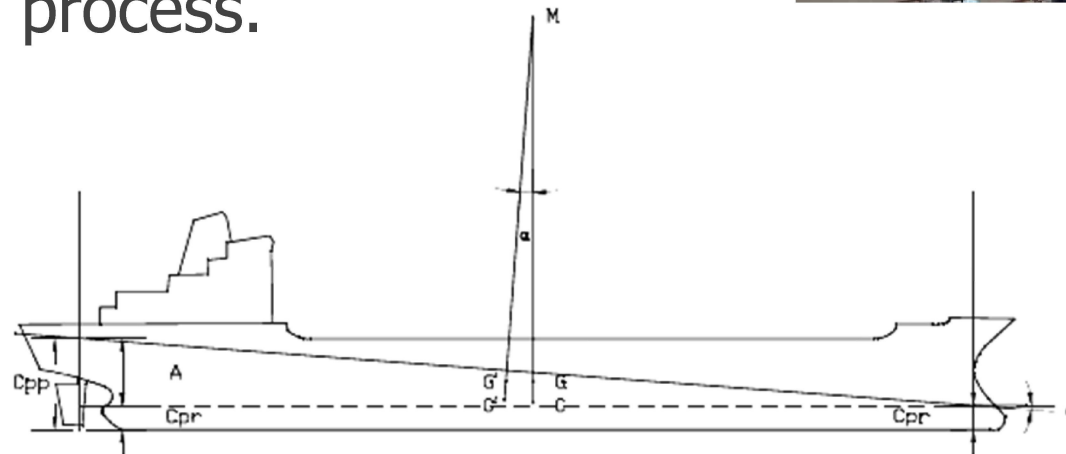
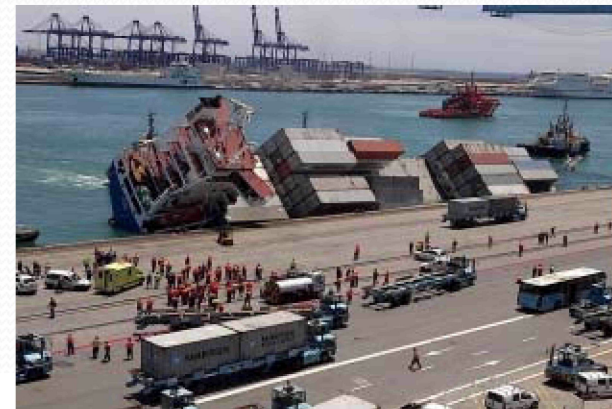
GOALS

- Reduce time through an autonomous process
- Suppress human intervention
- Improve security; both personal and maritime

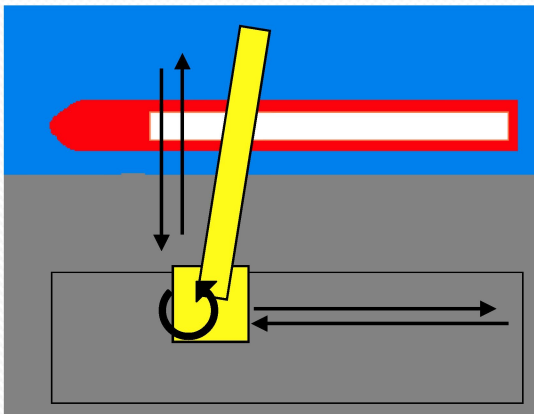


STABILITY

Affected by the change in the centre of mass during the unloading process.



Crane movements



The containers and its location are defined using matrix.

3	2	1	1	2	3
3	3	2	2	3	3
2	3	3	3	3	2

- Adjust angle: Rotation matrices
- Lift container: Translation matrices
- Adjust X & Y axis: Reflection matrices

Numbers of containers
in each position



Results

- The tool designed uses DERIVE for simulating different patterns and computing the execution time
- Proposes optimal download strategy



Conclusions

- Good “feeling” for students
- Useful material
- “Attractive” competition



THANK YOU



Applications of
Computer
Algebra

ACA 2013