



SEM0104 - Aula 1

Introdução e Motivação

Prof. Dr. Marcelo Becker

SEM - EESC - USP

Prof. Dr. Marcelo Becker - SEM - EESC - USP

Sumário da Aula

- **Informações sobre o Curso**
- Introdução
- Histórico
- Exemplos de Aplicação

Informações sobre o Curso

- Aulas 2^{as} (10h – 12h) e 4^{as} (10h – 12h)
- Nota:
$$\frac{P_1 * 3 + P_2 * 4 + \text{Projetos} * 3}{10}$$
- Datas da Provas:
 - P₁: 22/ABR/2015
 - P₂: 17/JUN/2015
 - Competição: 24/JUN/2015
 - Sub.: 01/JUL/2015 (apenas para quem faltou)

Informações sobre o Curso

Ementa do Curso

- As equações gerais de movimento e tipos de mecanismos.
- Mecanismos articulados.
- Métodos gráficos.
- Polígonos de velocidade e aceleração.
- Dinâmica de Mecanismos.
- Cames.
- Engrenagens cilíndricas com dentes com perfil de envolvente.
- Trens de engrenagens.
- Mecanismos planetários.

Informações sobre o Curso

Bibliografia Recomendada

- Shigley, JE. e Uicker, JJ., 1995, "*Theory of Machines and Mechanisms*".
- MABIE, H.H., OCVIRK, F.W. "Mecanismos e dinâmica das máquinas".
- MARTIN, G.H. "Cinematics and dynamics of machines".
- NORTON, R. L. "Design of Machinery - An Introduction to the Synthesis and Analysis of Mechanisms and Machines"
- Notas de Aula

Contato

Prof. Dr. Marcelo Becker

Av. do Trabalhador são-carlense, 400

São Carlos - SP - 13566-590 – Brasil

Prédio da Mecatrônica – 2º andar – sala 29122

Tel: 16 - 3373 8646

e-mail: becker@sc.usp.br

Skype: marcelo.becker

Sumário da Aula

- Informações sobre o Curso

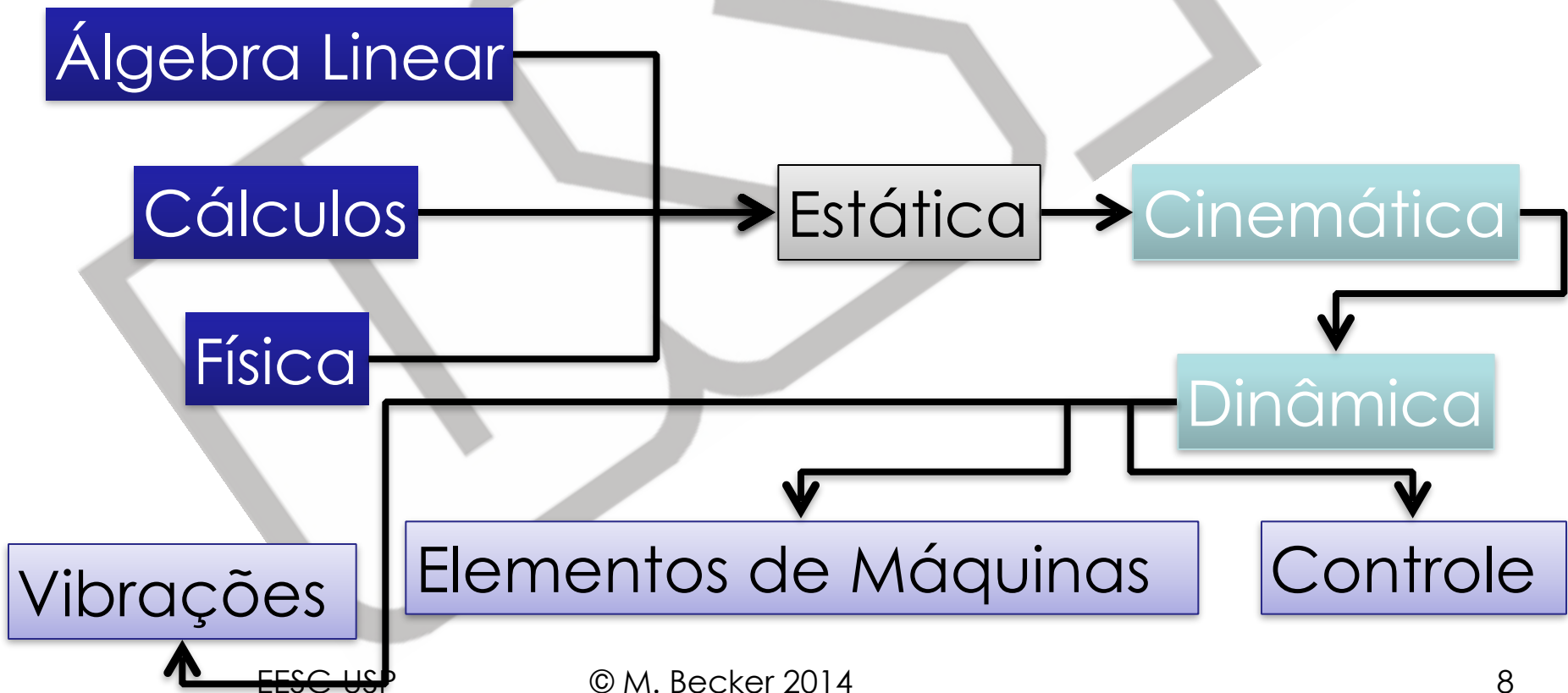
- **Introdução**

- Histórico

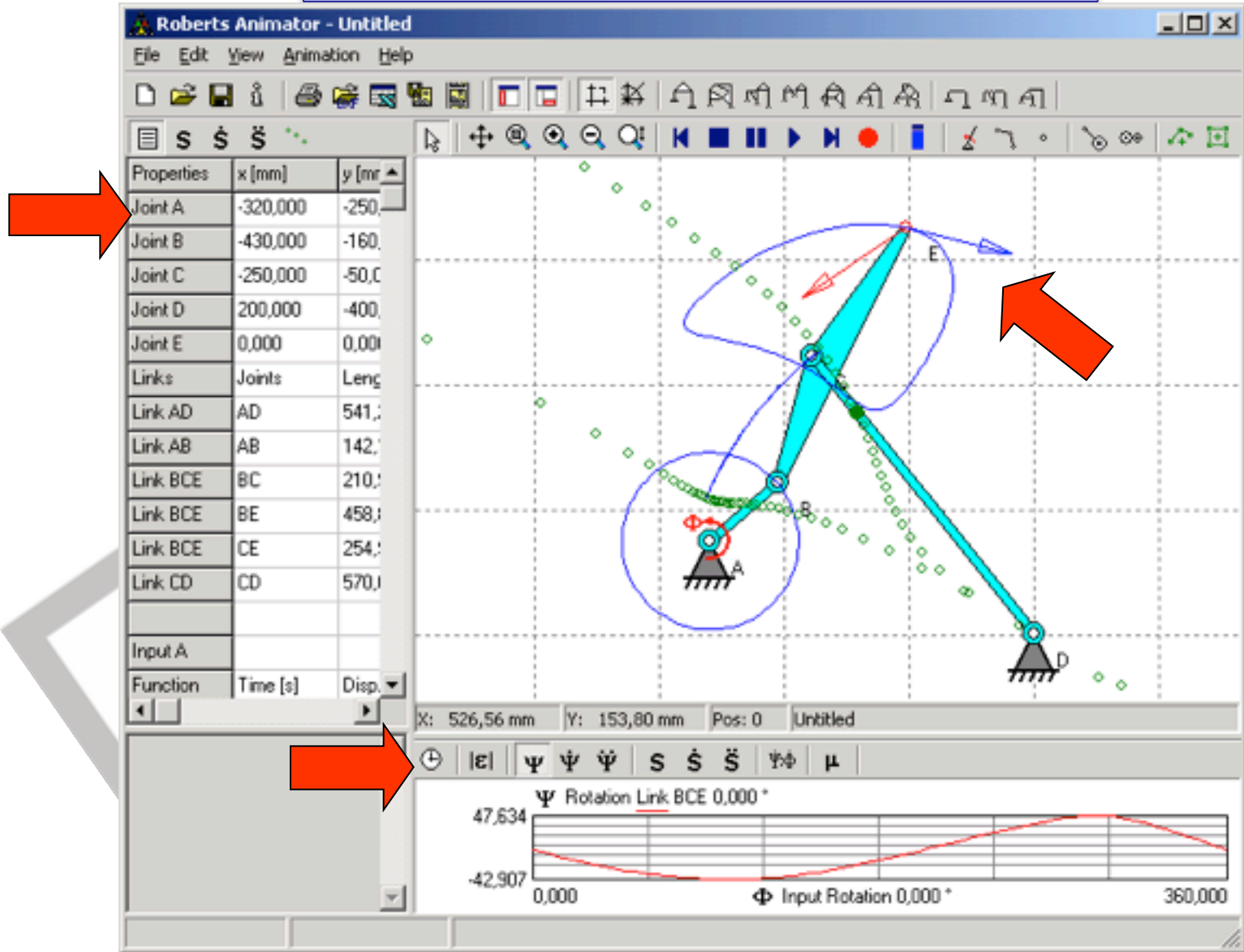
- Exemplos de Aplicação

Introdução e Motivação

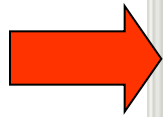
- Pergunta: O porquê de se estudar mecanismos?



Análise de Mecanismos



Síntese de Mecanismos



Watt Demo - bo

File Edit View Ar

Mechanism | Output Link | Ground Link

Name	Nr
Stephenson 3	11
Stephenson 3	30
Fourbar	10
Stephenson 3	29
Stephenson 3	12
Stephenson 3	17
Stephenson 3	9
Stephenson 3	49
Stephenson 3	33
Fourbar	8
Stephenson 3	72
Stephenson 3	78
Stephenson 3	43
Stephenson 3	41
Stephenson 3	2
Fourbar	4
Fourbar	7
Fourbar	5
Fourbar	1
Fourbar	2
Fourbar	3

Path Error | Path | Velocity | Acceleration | Output | Output Velocity | Output Acceleration

Error = 0.000 mm

7.329

0.000

0.000 Input Rotation = 0.000 ° 120.030

X: -146.74 mm Y: 138.11 mm



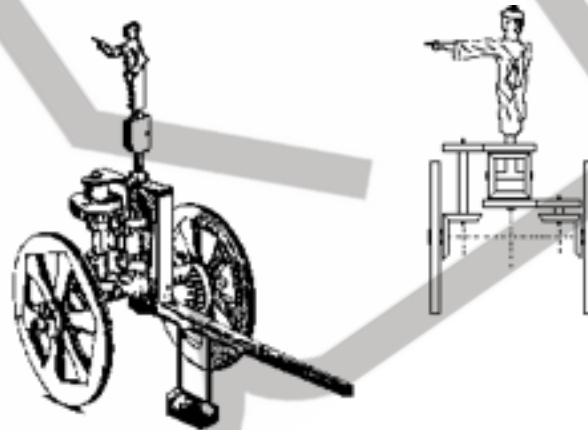
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- **Histórico**
- Exemplos de Aplicação

Histórico

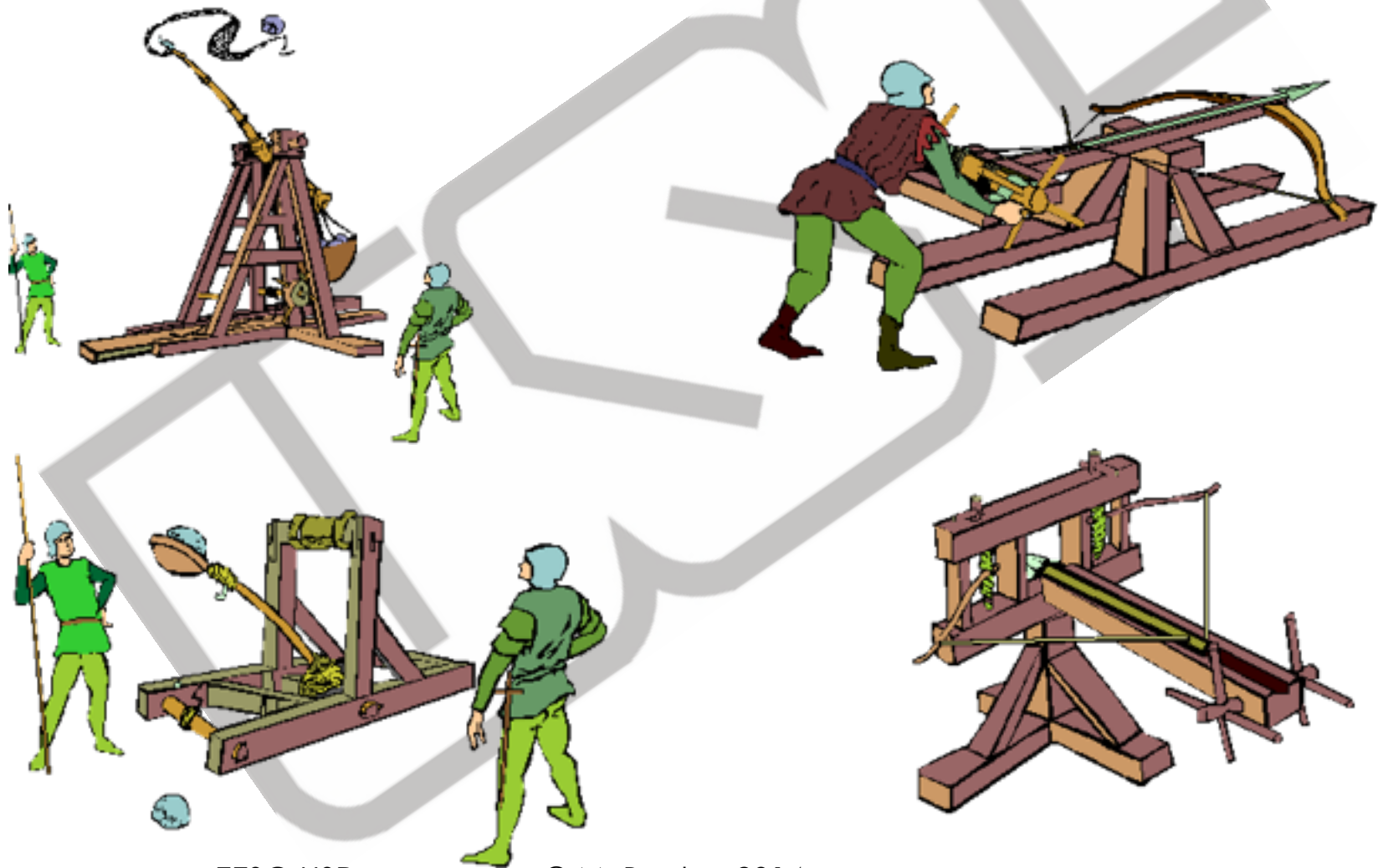
Carroça Chinesa (2.634 a.C.)

Imperador Huang Di (China)



Histórico

Armas

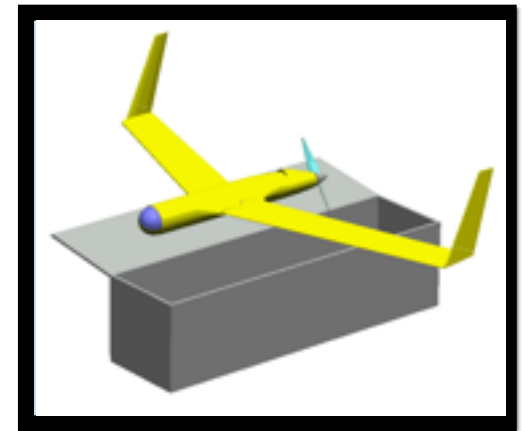


Histórico

Catapultas 'Modernas'

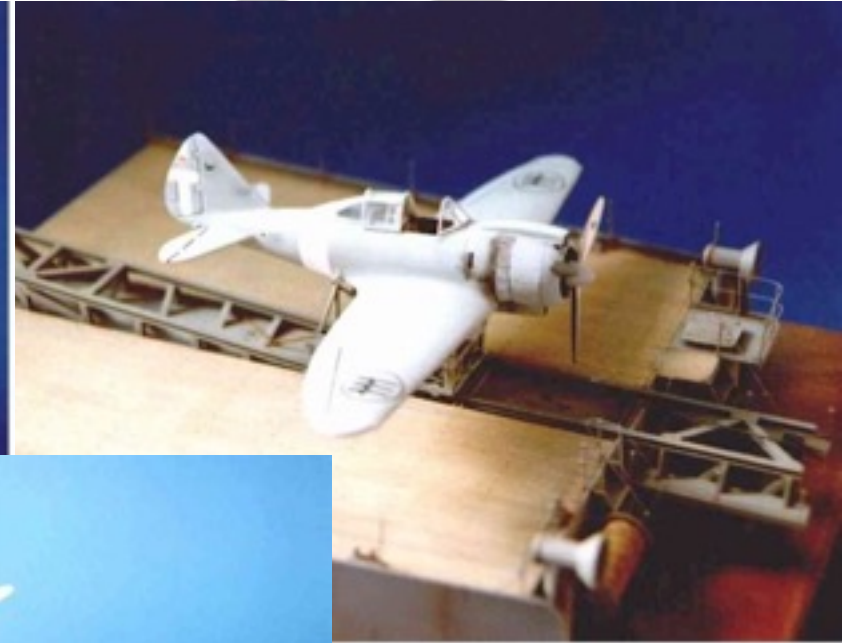
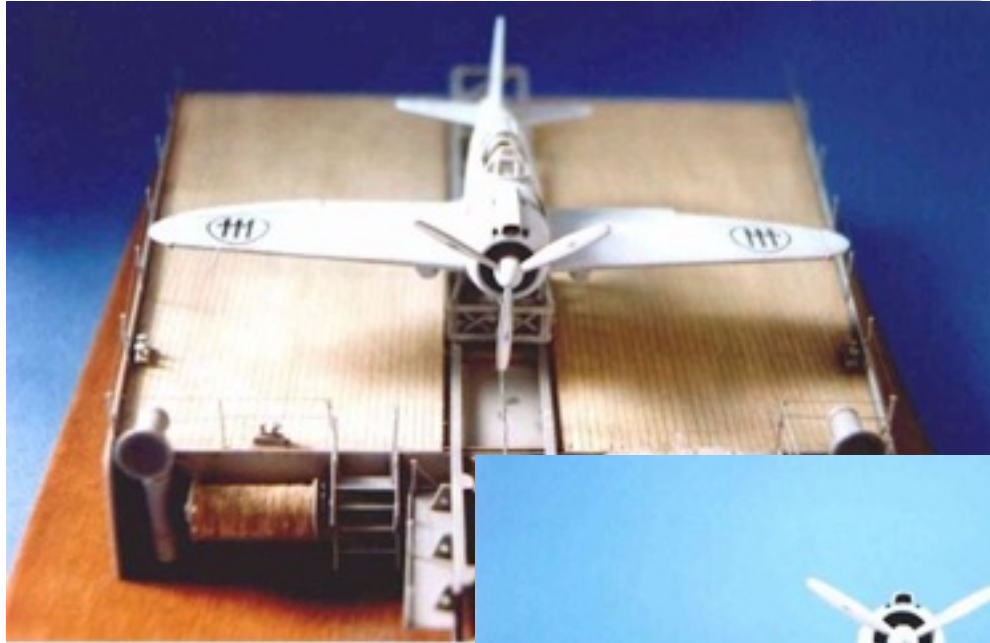
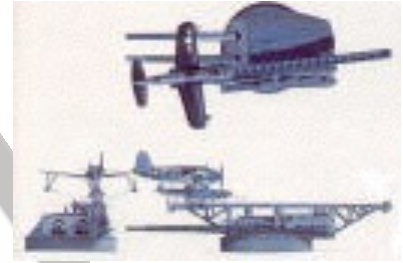


Aeromodelos
e
Planadores



Histórico

Catapultas 'Modernas'



Histórico

Catapultas 'Modernas'



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Histórico

Catapultas 'Modernas'



Histórico

Armas



Cel. Samuel Colt
(*1814 + 1862)

Peças
Intercambiáveis



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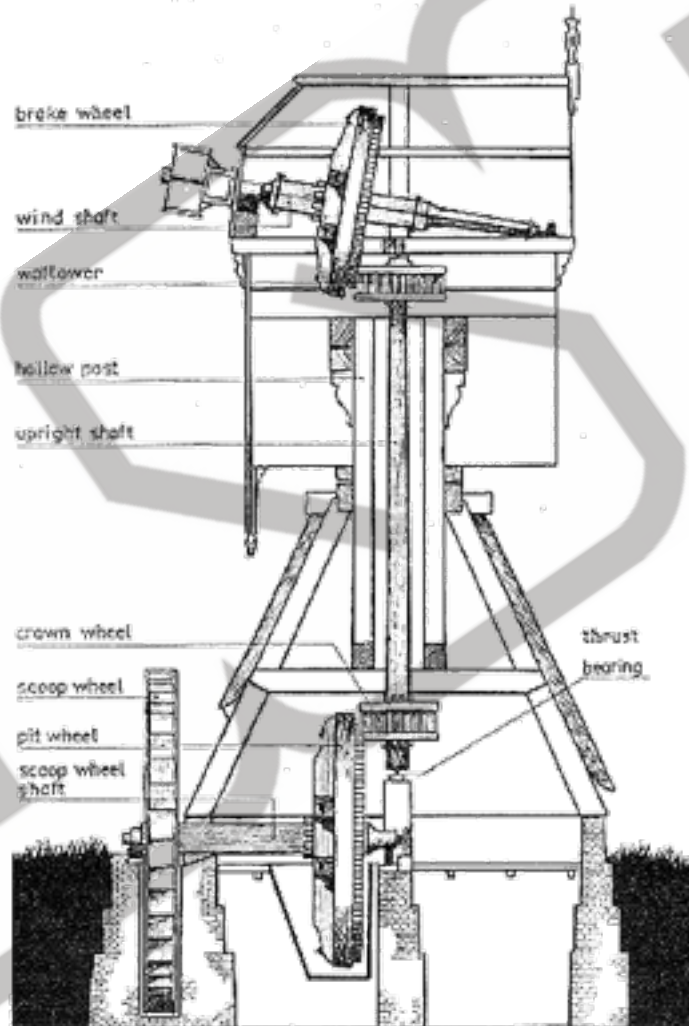


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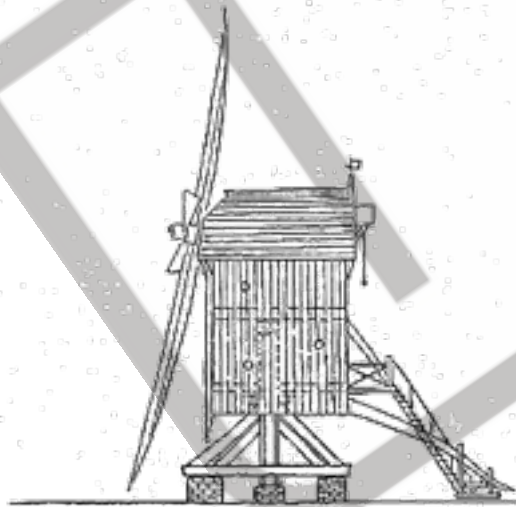
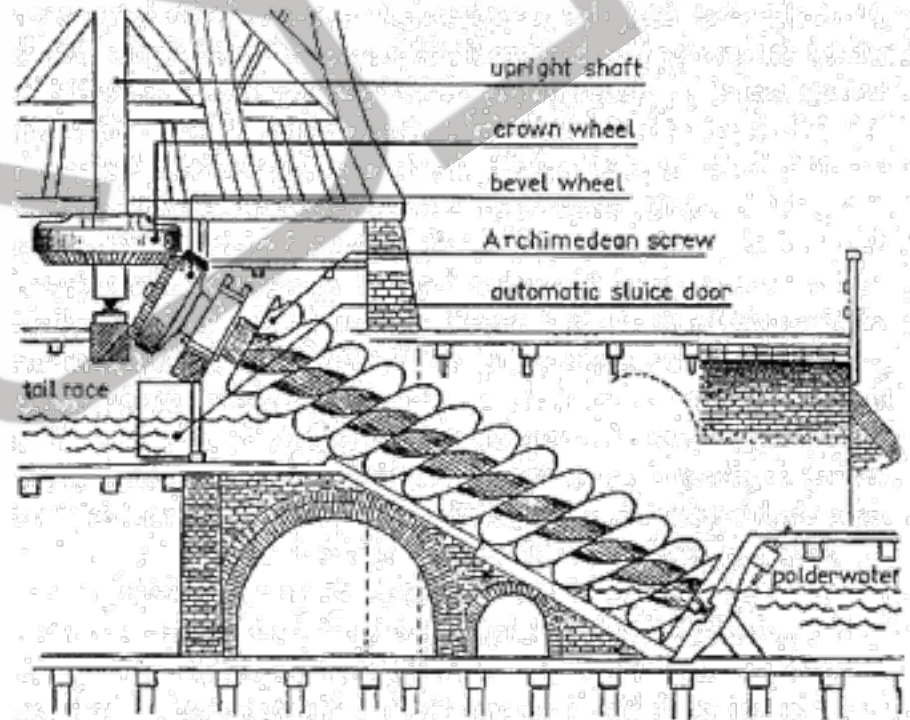
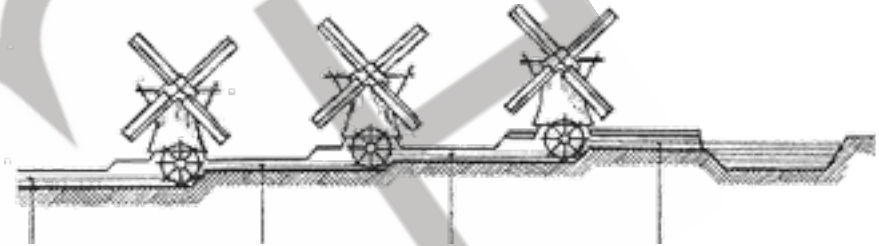
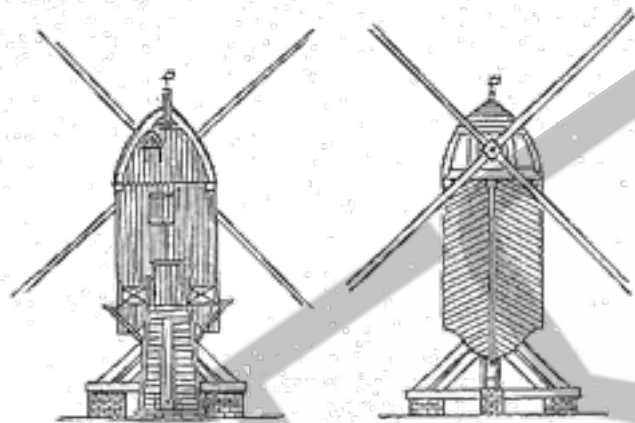
Histórico

Moinhos de Vento



Histórico

Moinho de Vento

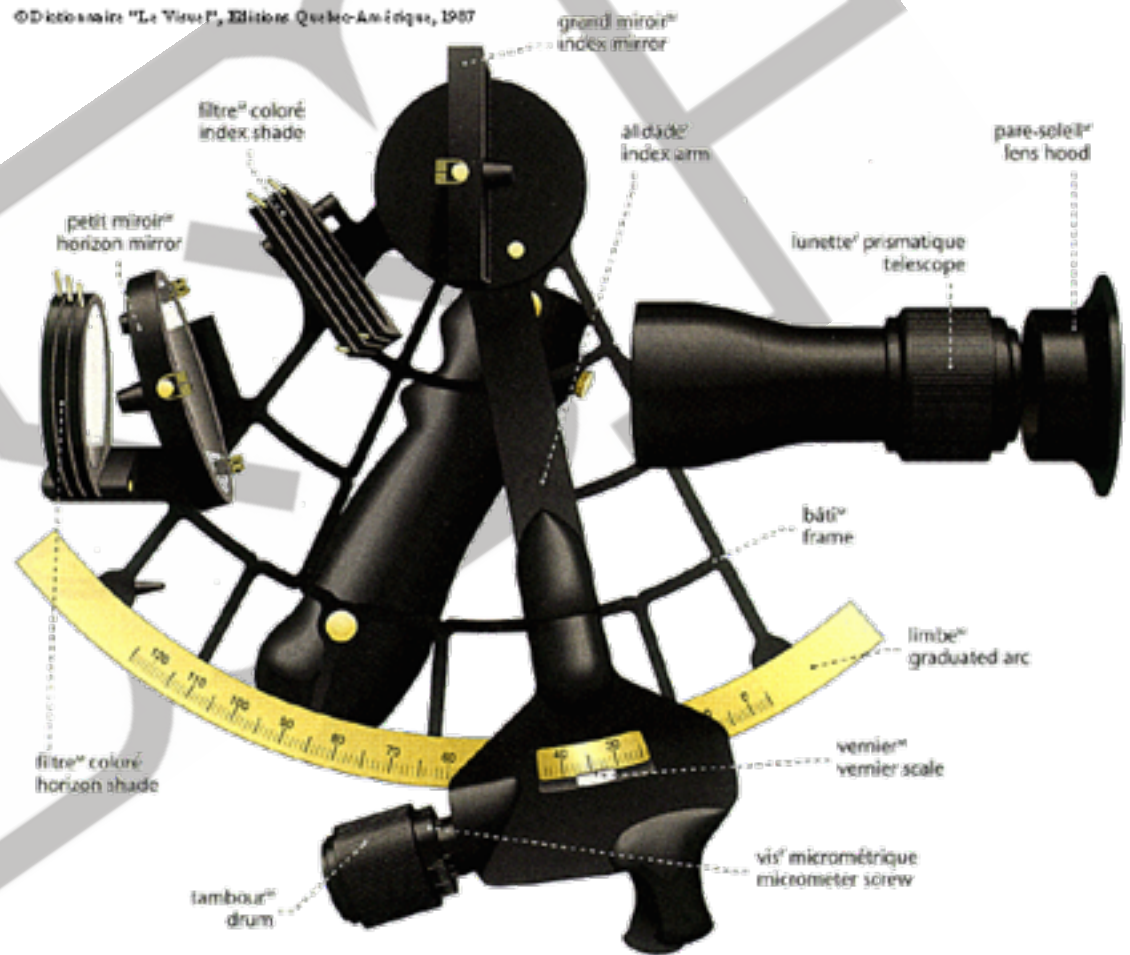


Histórico

Instrumentos de Navegação

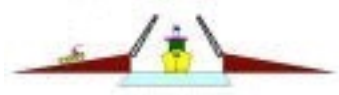


© Dictionnaire "Le Yacht", Histoire Quatre-Amériques, 1987



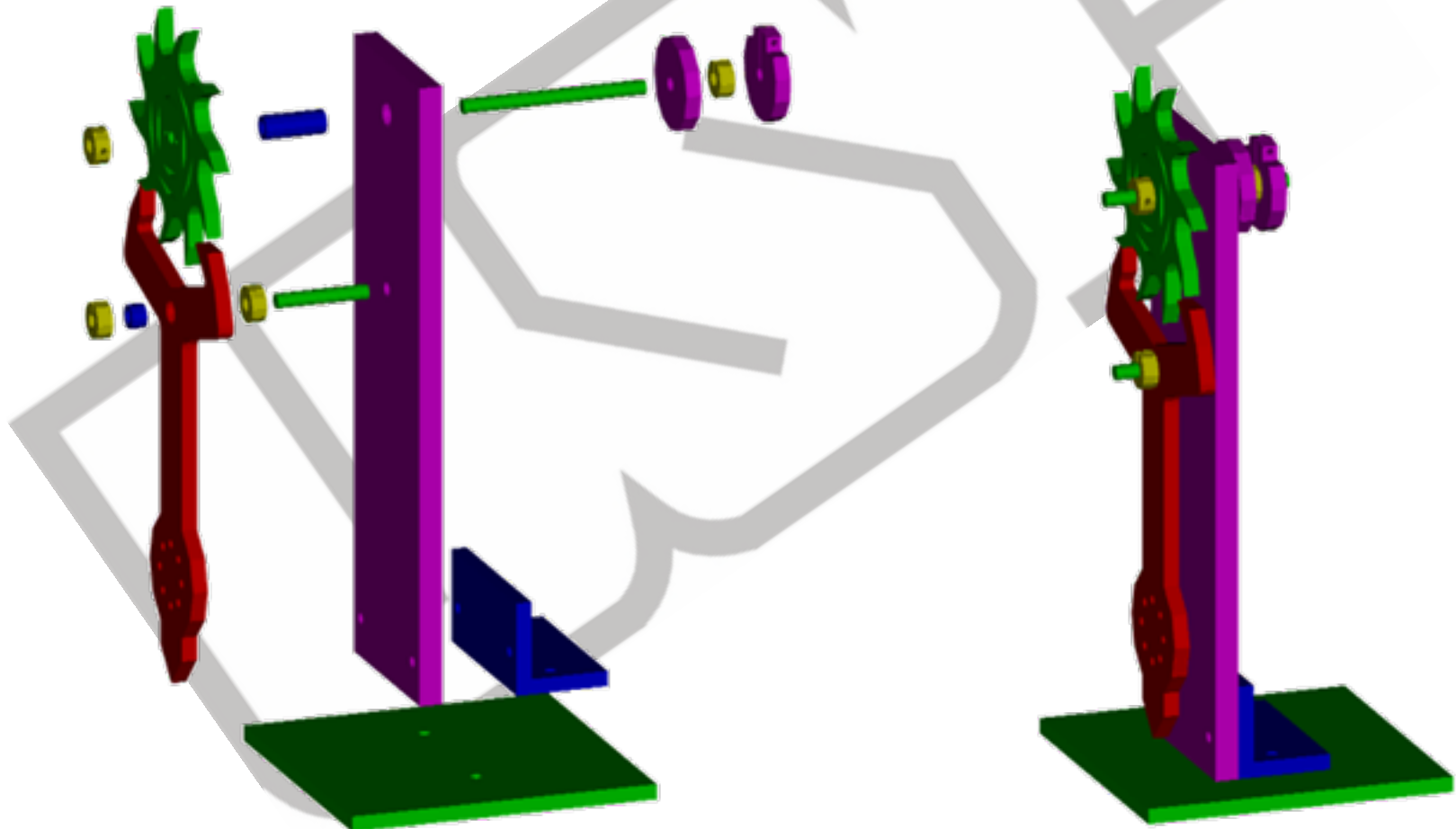
Histórico

Pontes Elevadiças - Basculantes



Histórico

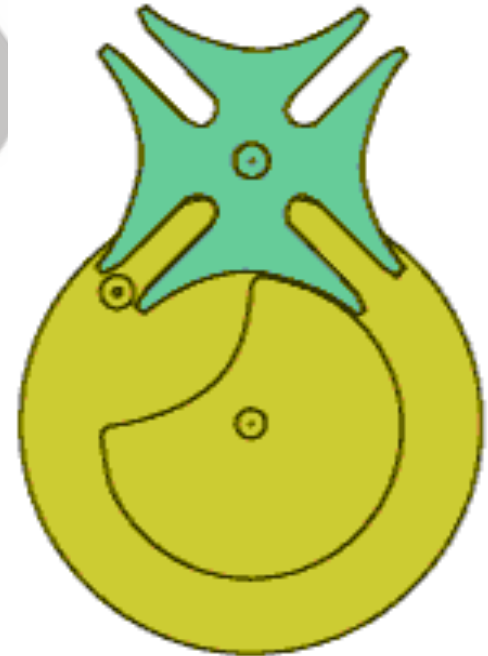
Relógios



Histórico

Relógios

Clockworks



Histórico

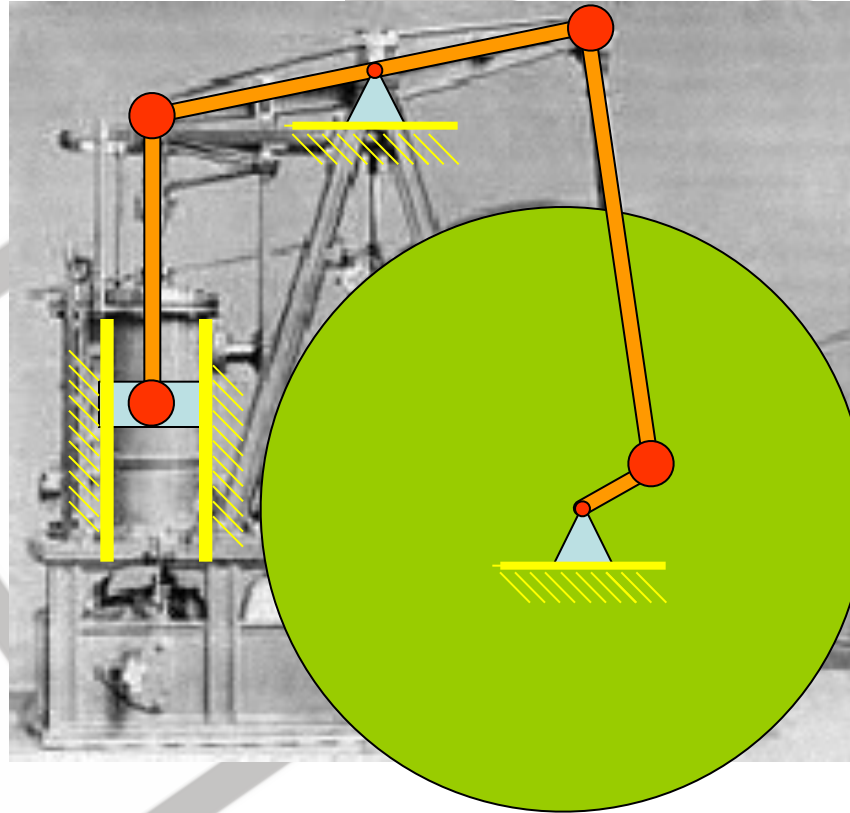
Máquina a Vapor – Século XVIII



James Watt

* 1736

+ 1819



1755 – Máquina a Vapor

Histórico

Teares

Revolução Industrial
Inglaterra – séc. XIX

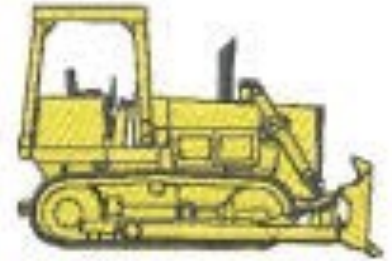


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- **Exemplos de Aplicação**

Exemplos de Aplicação

Indústria

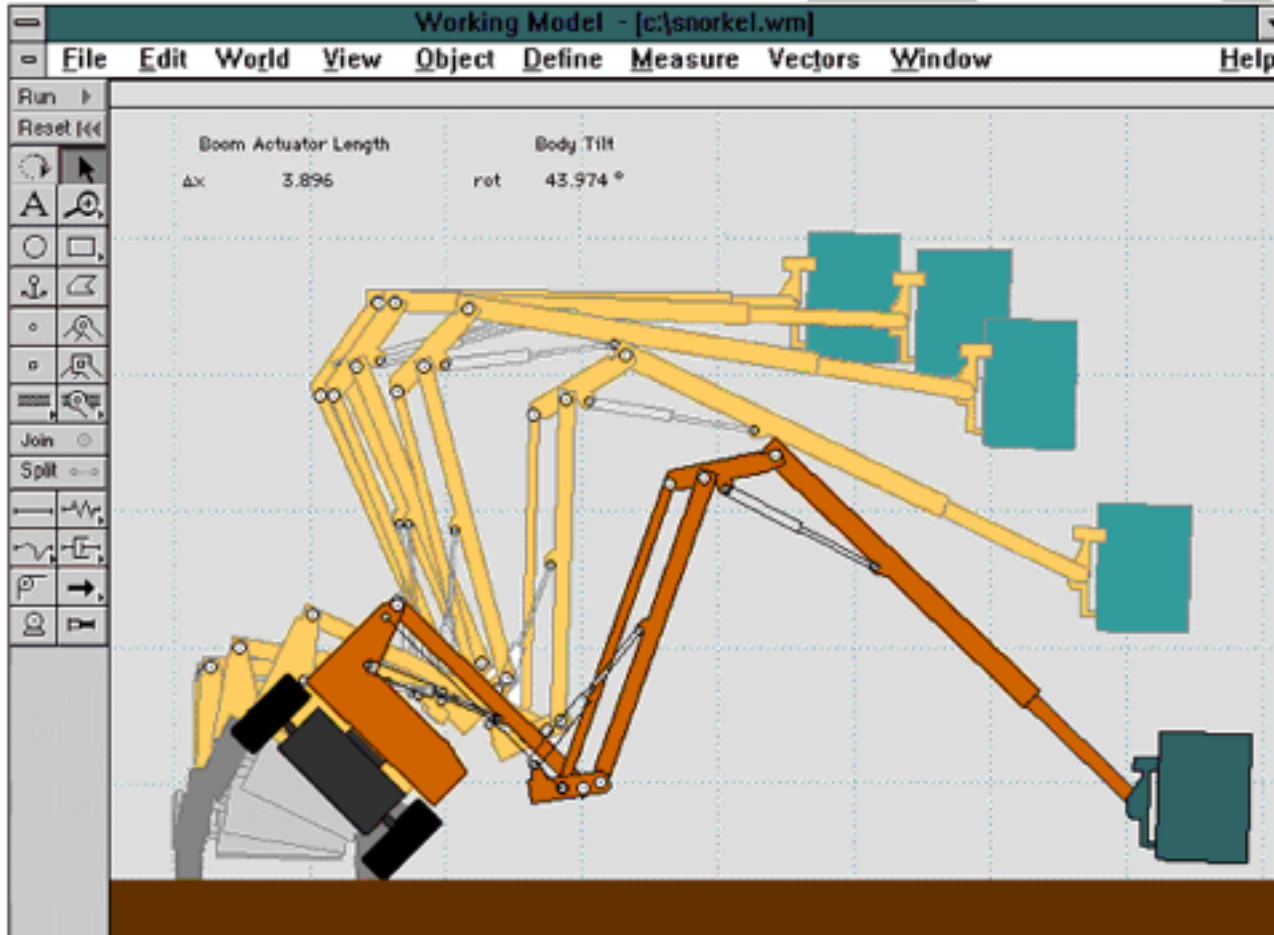


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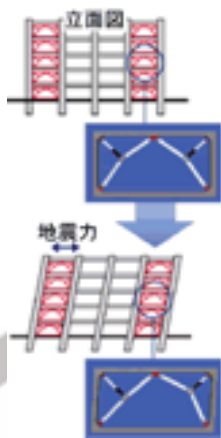
28

Exemplos de Aplicação Indústria



Histórico

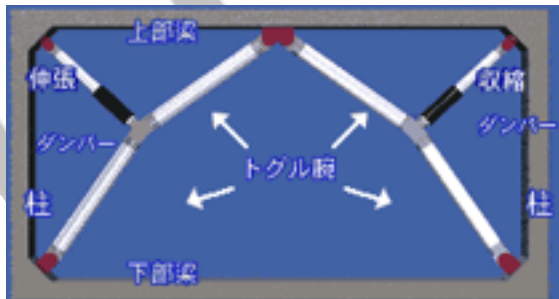
Indústria Civil - Terremotos



TYPE-1 両妻トグル制震



TYPE-2 構面外トグル制震



Exemplos de Aplicação

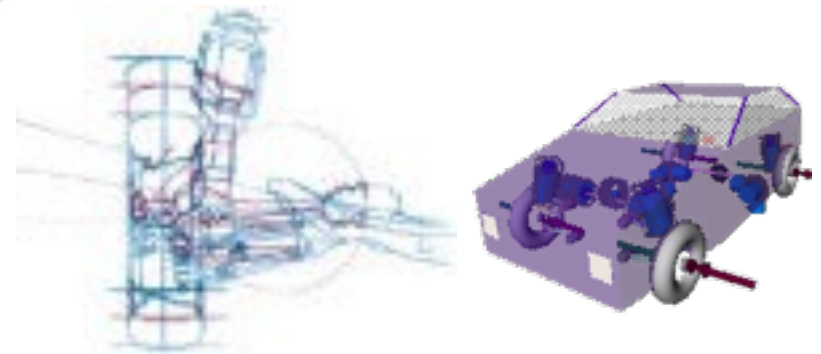
Bicicletas / Carros



EESC-USP

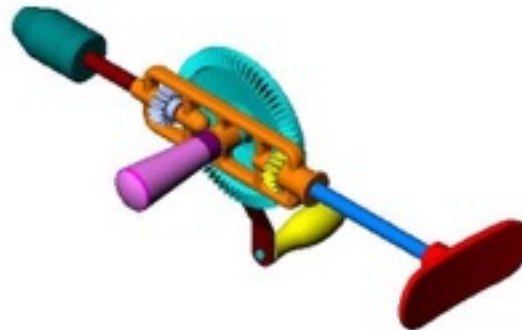
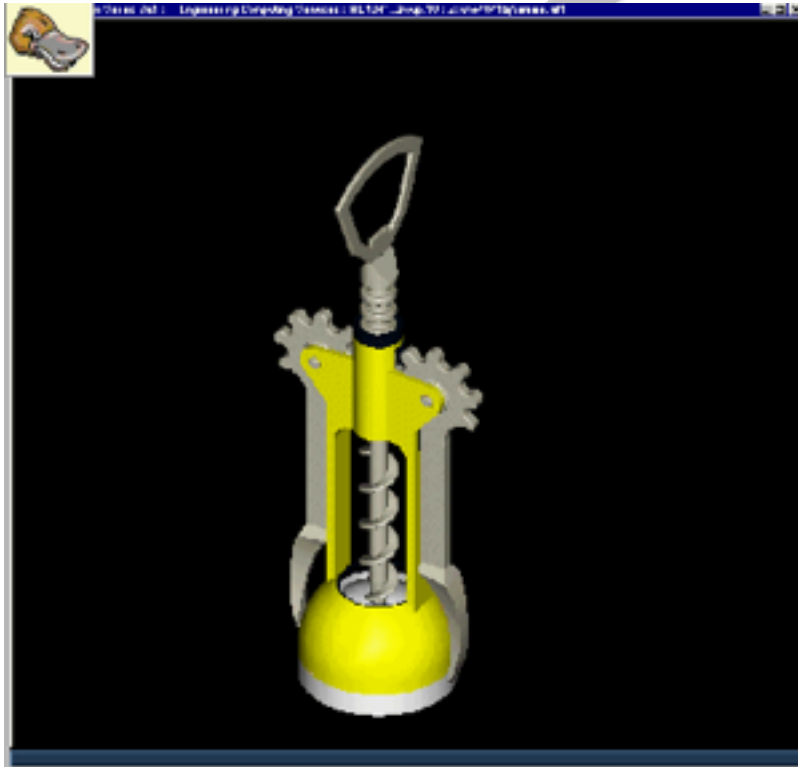
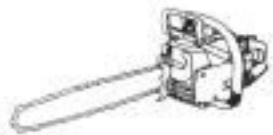


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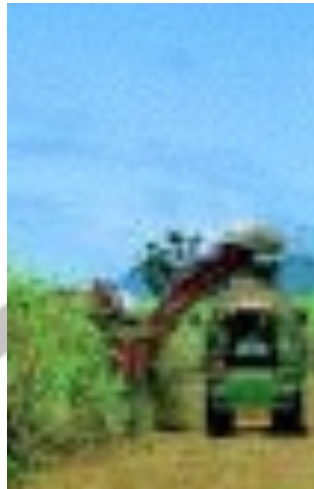
Exemplos de Aplicação

Utensílios Domésticos / Ferramentas



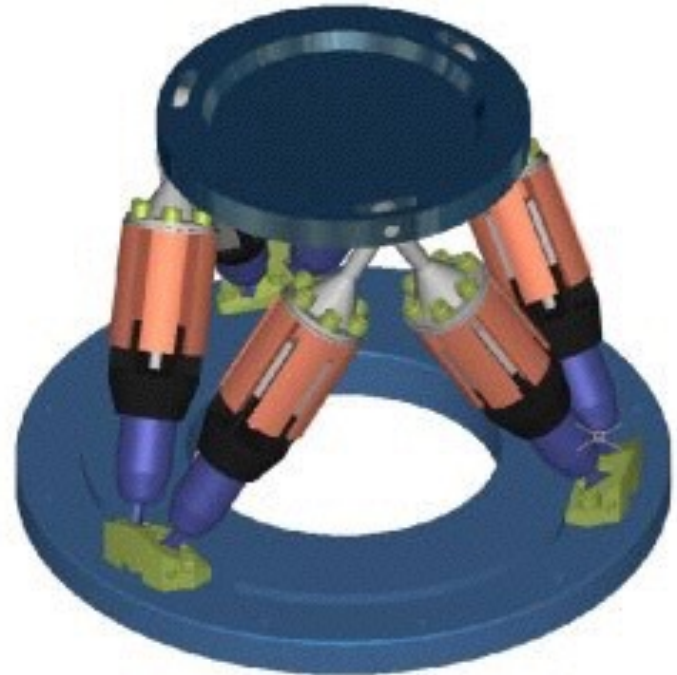
Exemplos de Aplicação

Agro-Industria

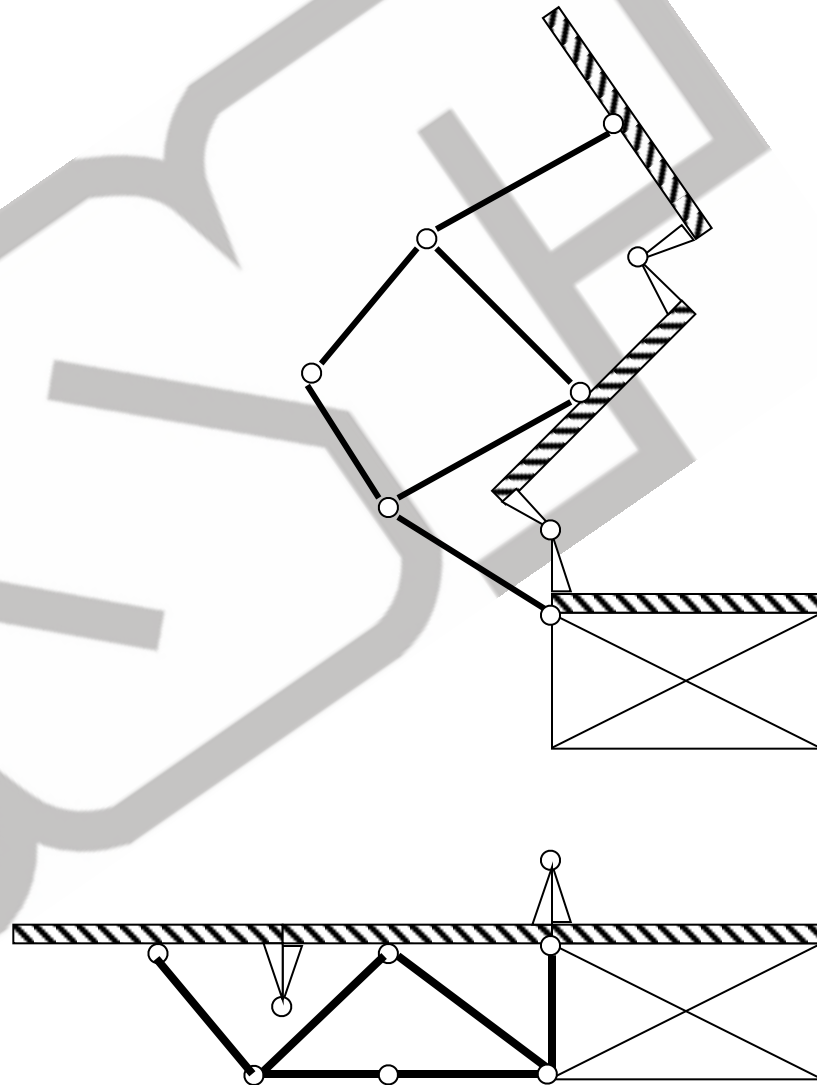


Exemplos de Aplicação

Simuladores

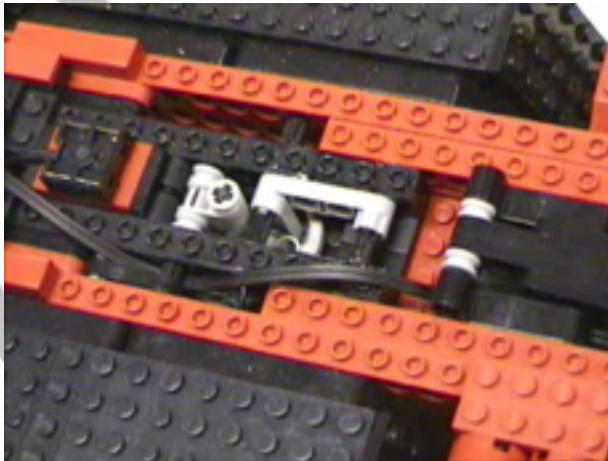
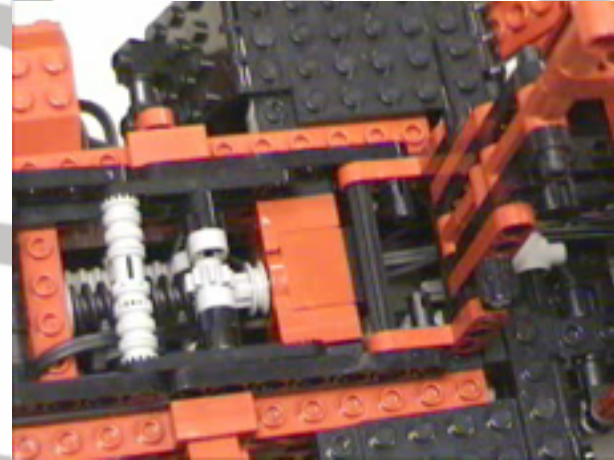


Histórico Satélites



Exemplos de Aplicação

Brinquedos - Lego



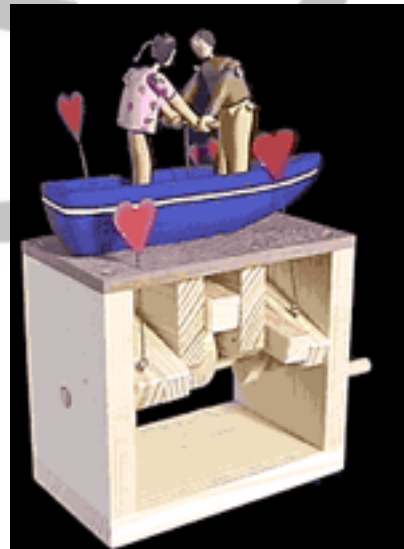
Exemplos de Aplicação

Brinquedos - Automata

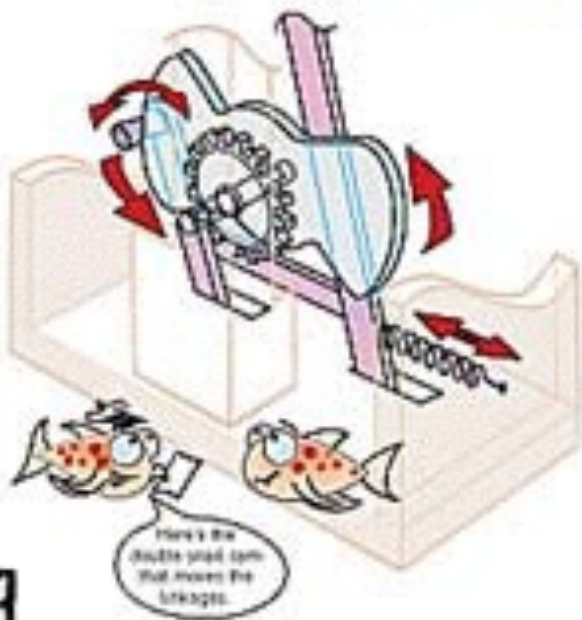
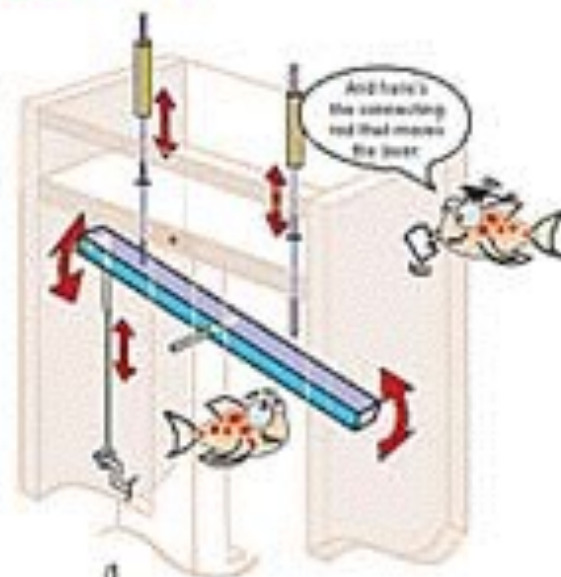


Exemplos de Aplicação

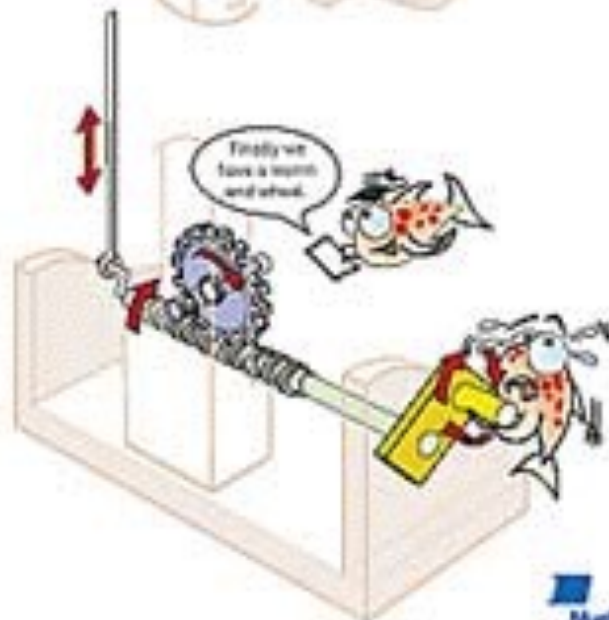
Brinquedos - Automata



MAKING MOVEMENT

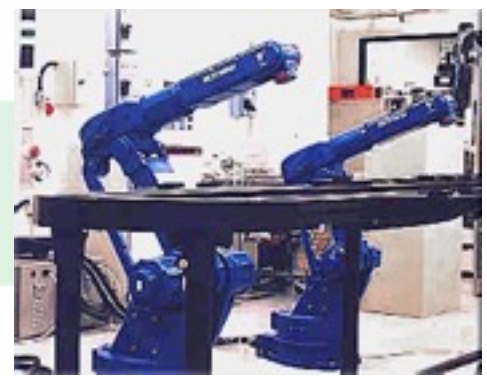


Turn the handle and the fish move left, right, backwards and forwards. This poster shows the mechanisms that create the movement. Can you explain what each one does? How do they work together?



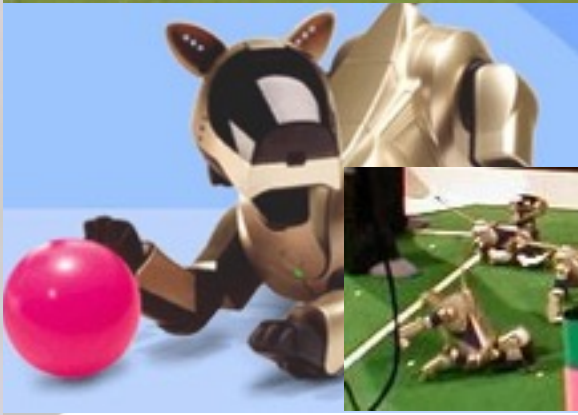
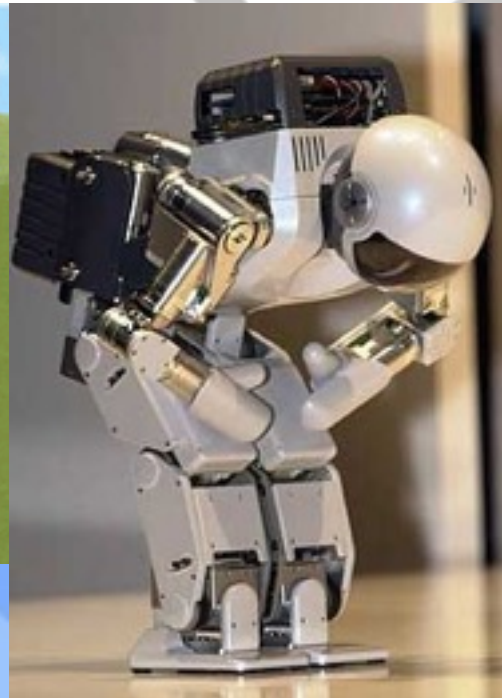
Exemplos de Aplicação

Robótica “Ontem”



Exemplos de Aplicação

Robótica “Hoje”



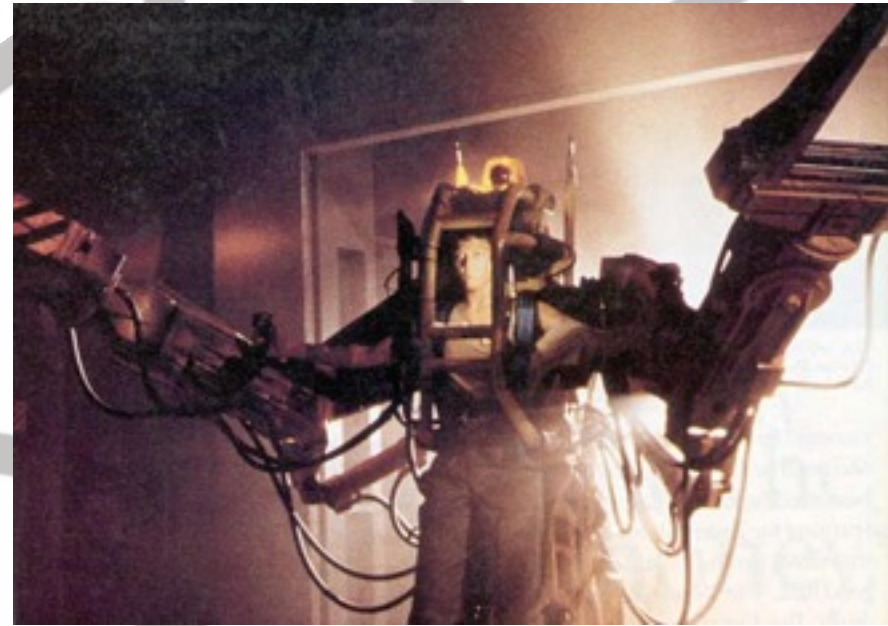
Exemplos de Aplicação

Robótica “Amanhã”

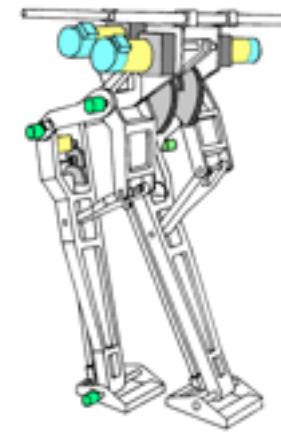
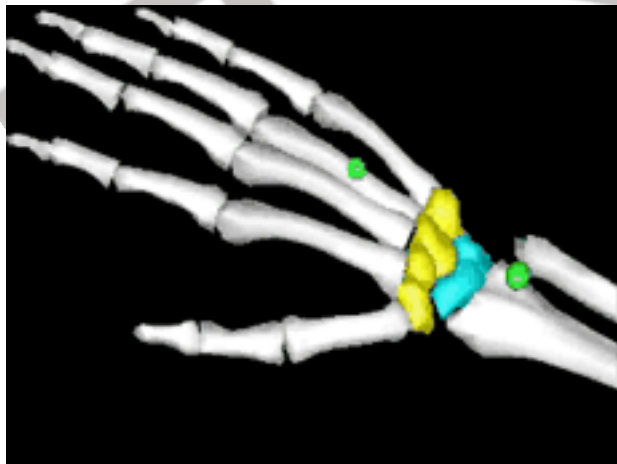
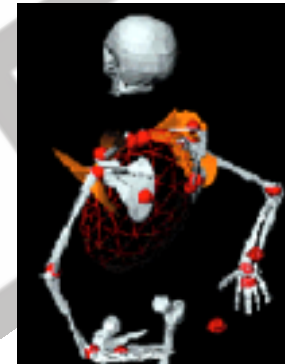


Exemplos de Aplicação

Robótica - Cinema



Exemplos de Aplicação Biomecânica



A large, light gray watermark of the letters 'EESC' is oriented diagonally across the page. The letters are thick and stylized, with the 'E' and 'S' having rounded, blocky shapes. The 'E' is on the left, the 'S' is in the middle, and the 'C' is on the right. The watermark is semi-transparent, allowing the text 'Perguntas?' to be clearly visible over it.

Perguntas?

Próxima Aula

- Graus de Liberdade
- Cadeias Cinemáticas
- Pense: Quantos movimentos tem sua mão?

