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International Engineering College Leuven

Luc Janssens

In the past

- Technological courses
- Management courses
- Communications courses

Challenge

- Learn to attack problems
- Designing new products
- Setting up a production process
- Improving quality

Paying attention to:

- Engineering
- Management
- Acquiring knowledge and passing through



Engineering Experience
Project based education

Engineer
Entrepreneur
Educator

Engineering Experience

Project based education

Not only apply but also integrate those 3E aspects into a project.

The student should behave as an
Engineer, Entrepreneur and
Educator



Engineering Experience

Project based education

- 1. Problem description**
- 2. Work breakdown structure**
- 3. Planning (Gantt Chart)**
- 4. Peer assessment**



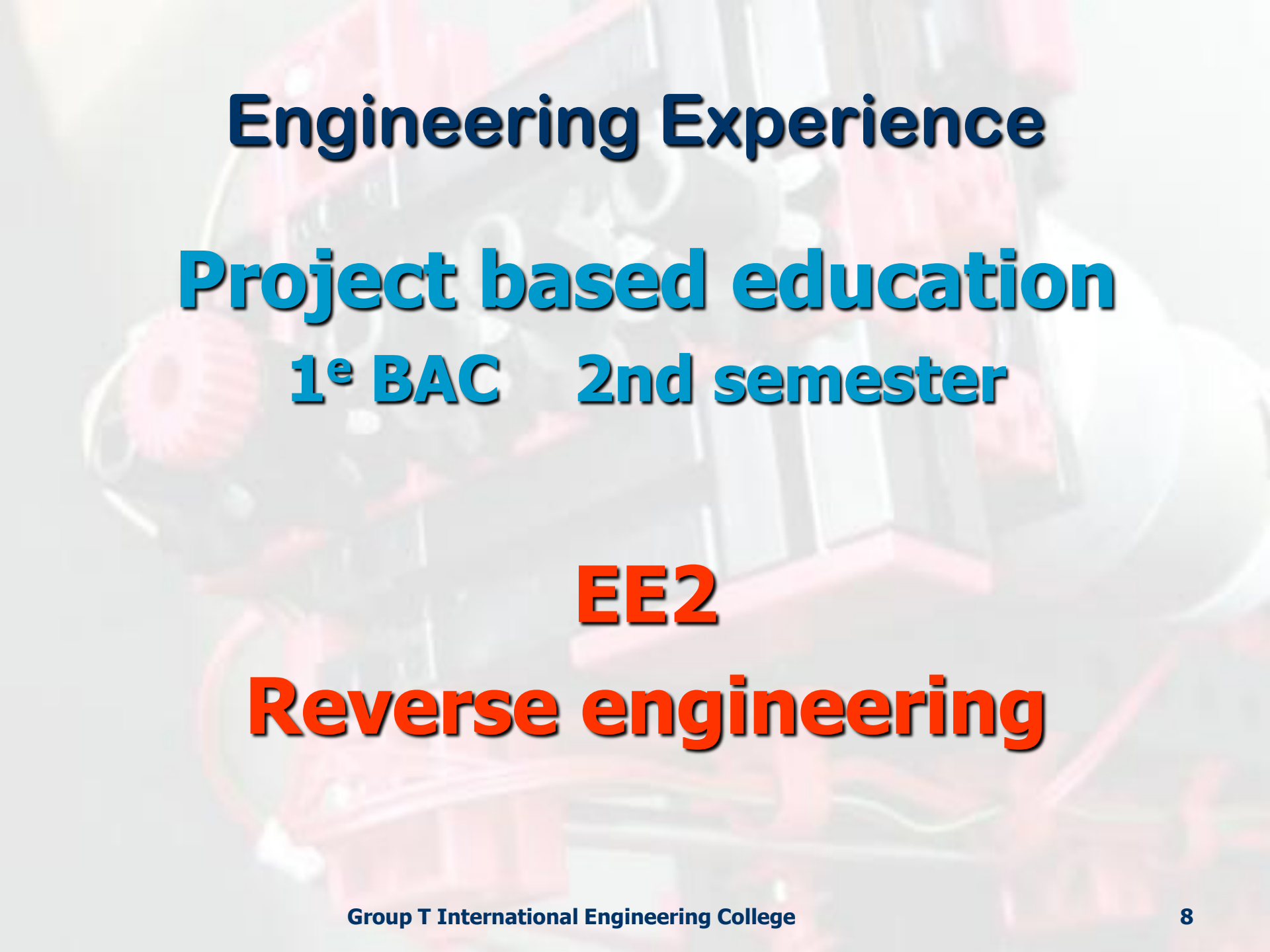
Engineering Experience

Project based education

1^e BAC 1st semester

EE1

Whole system engineering



Engineering Experience

Project based education

1^e BAC 2nd semester

EE2

Reverse engineering



Engineering Experience

Project based education

2^e BAC 1st semester

EE3

Make stuff work!

Engineering Experience 3

Make stuff work!

- **Applying skills in Enterprising and Educating in EE1 en EE2**
- **Build a system where different technologies are used**
- **Multidisciplinary: Informatics, electronics, mechanics.....**



Engineering Experience 3

Make stuff work!

Computer Based Control

Engineering Experience 3: Computer Based Control

Goal:

Engineering:

Building : Machine with actors and sensors

Control : Measure and control with a PC

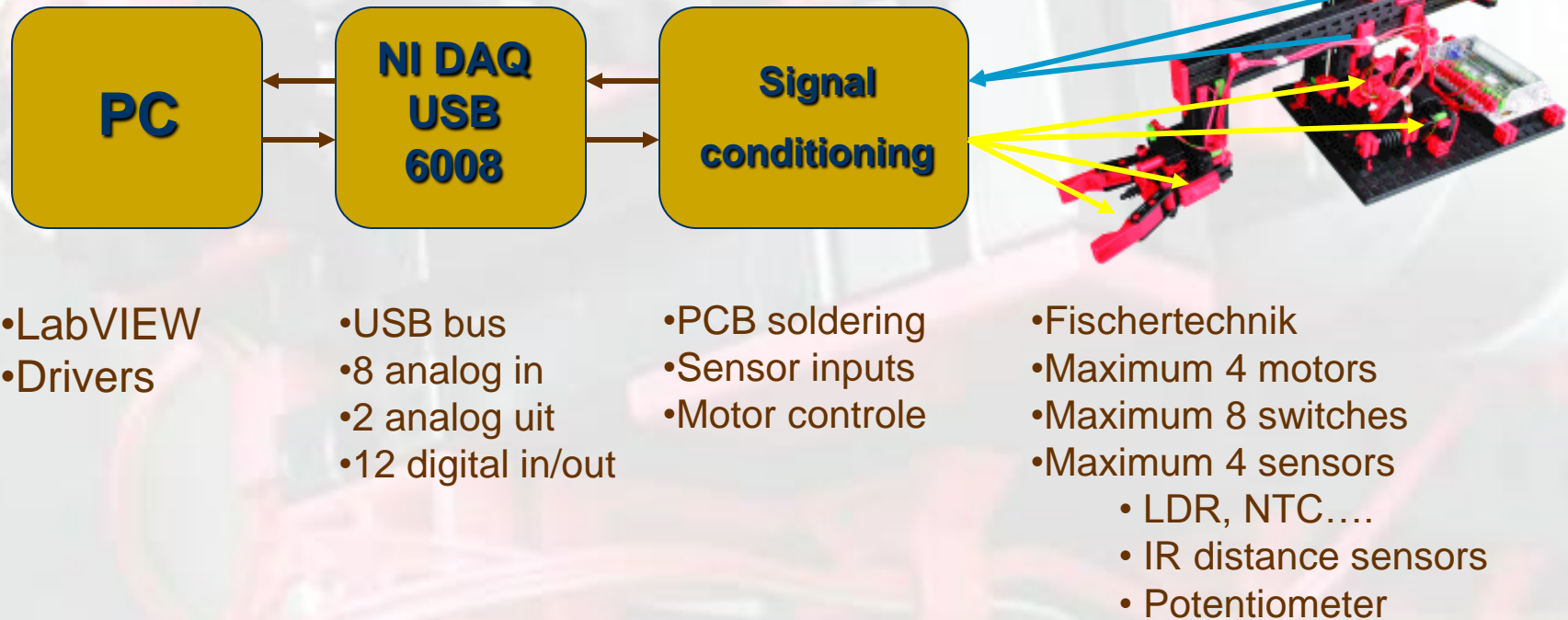
Enterprising : Economical analysis of the machine

Educating : Working in a team

Engineering Experience 3: Computer Based Control

- **2^{de} Bac 1st semester**
- **In 30 teams of 4 to 6 students**
- **Each team has a coach**

Engineering Experience 3: Computer Based Control Engineering



Engineering Experience 3: Computer Based Control

Progression students:

Learning faze:

**Workshop LabVIEW in 3 weeks (12h)
under supervision of a coach and
trough self study.**

Engineering Experience 3: Computer Based Control

Progression students:

Analysing faze :

Examining the interface:

Seminar 1: Study of the USB6008 interface

- Reading and writing digital and en analog data signals by a PC using LabVIEW.
- Followed by a guided session.

Seminar 2: Signal conditioning

- Motor control and soldering skills.

Engineering Experience 3: Computer Based Control

Progression students:

Development and building faze:

- Designing the system (Fishertechnic) with the minimal requirements (min 1, max 4 sensors)
- Building the system robot, cabling, interface, PCB.
- Software development in LabVIEW.
- Testing.

Engineering Experience 3: Computer Based Control **Evaluation:**

End products:

- Presentation of the finished project
- LabVIEW program
- End report
- Answering questions on engineering and enterprising, flowchart and process report

Engineering Experience 3: Computer Based Control Evaluation:

Quoting:

- Evaluation of the technical product
- Report
- LabVIEW program
- Tests (LabVIEW, hands on test interface....)
- Peer assessment

IEE 3		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<u>Labview</u>	Introductie tot LabVIEW 7.1 2x 4 u + 1 x 2 u	x + D	x + D	x + D											
	LabVIEW 7.1 – test 1 x 2 uur			x + D											
<u>Oriëntering</u>	Inleiding (bespreken studiewijzer), indelen in groepen (at random), samenwerkingscontract	x + D													
	Seminarie 1 communicatie van de PC naar de omgeving en vice versa, digitaal en analoog + sensoren		x + LJ												
	Analoge test case			x + D											
	Seminarie 2: motorsturingen en solderen				x + LJ										
	Motorsturing test case					x + D									
Analyse	1. Verduidelijk de opdracht 2. Definieer het probleem 3. Brainstorm analyse 4. Uitdiepen van ideeën 5. Ordening van de ideeën uit 4 6. Uitwerken van zelfstudie opdrachten <i>Plan van aanpak (go/no go)</i>		x	x	x										
<u>Uitvoering</u>	<i>Projectuitvoering</i> Conceptrapport Week 11					x	x	x + D	x	x + D	x	x + D			
<u>Afwerking en evaluatie</u>	Eindevaluatie van de robot Individuele test Peer assessment Eindrapport LabVIEW programma												x	x + D	
	Feedback														x + D

Evaluation score sheet

Onderdeel	beoordelen	Team/individueel	score
Plan van aanpak	Docent	Groep	Voldoende/onvoldoende
Eindrapport:			
Engineering	Docent	Team	(0-20)
Enterprising	Docent	Team	(0-20)
Procesverslag	Docent	Team	(0-20)
Robot	Jury	Team	(0-20)
Verdediging	jury	individueel	(0-20)
LabVIEW programma	Docent labview	Team	(0-20)
Test IEE 3	docent	individueel	(0-20)
Test LabVIEW	docent	Individueel	(0-20)
Peer <u>assessment</u>	studenten	Individueel	Bonus/malus 2 ptn op totale teamscore
Bijdrage tot proces	Docent	Individueel	Voldoende/onvoldoende

Engineering Experience 3: Computer Based Control

Educating:

- Peer assessment
- Feedback from coach in meetings
- Give feedback to each other

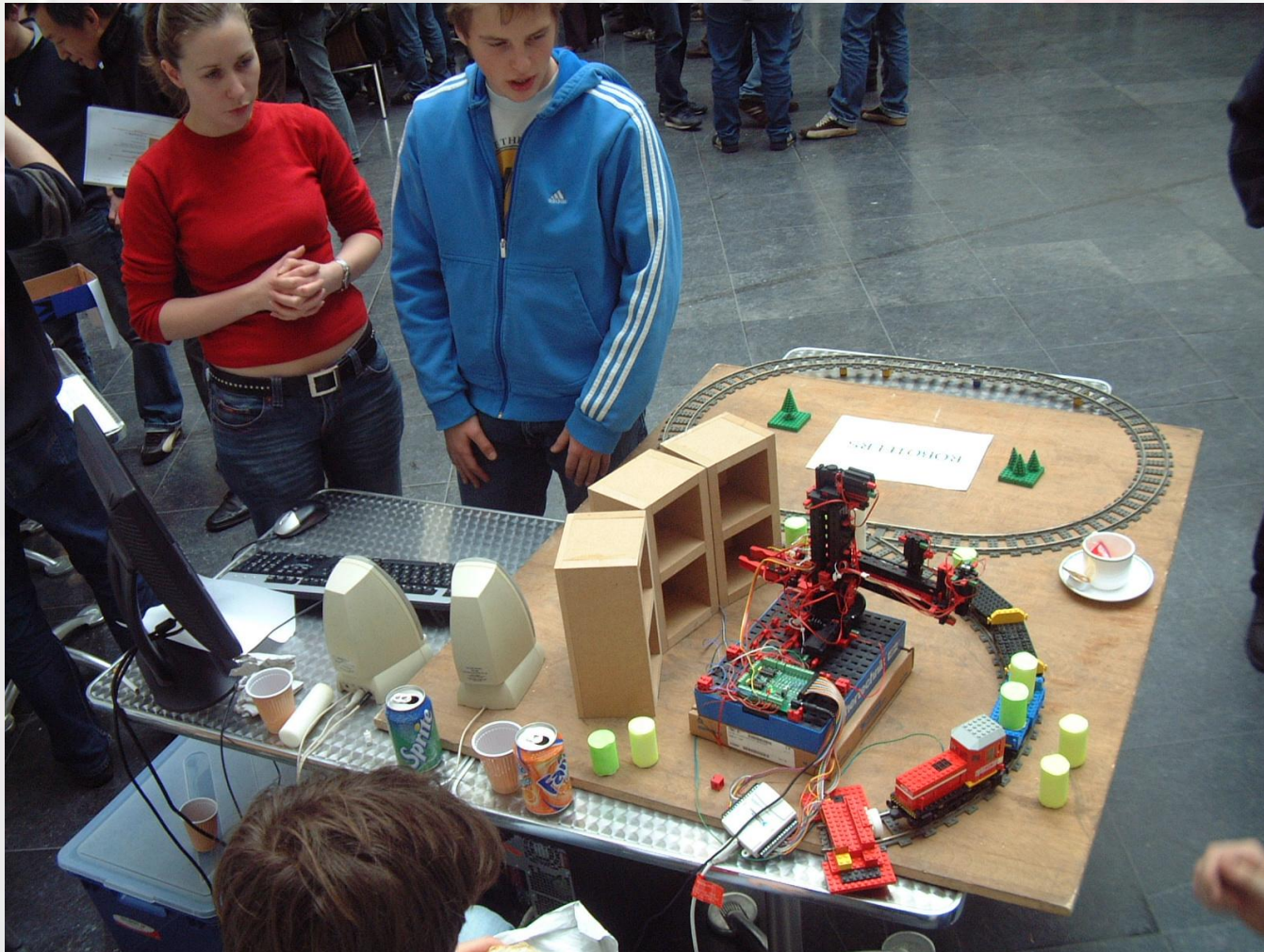
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Ideas?



Engineering Experience 3: Computer Based Control

Pick and place



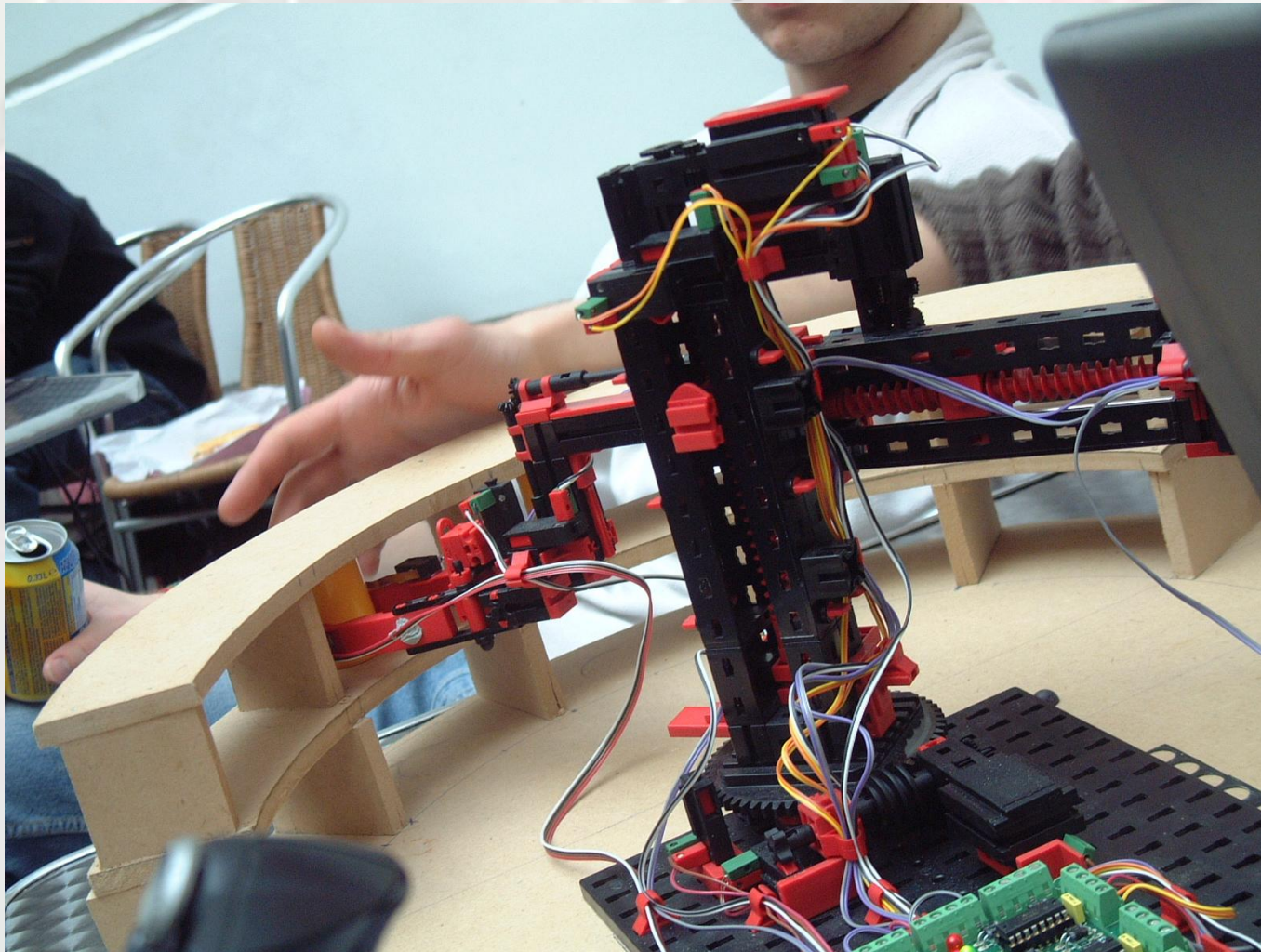
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Pick and place



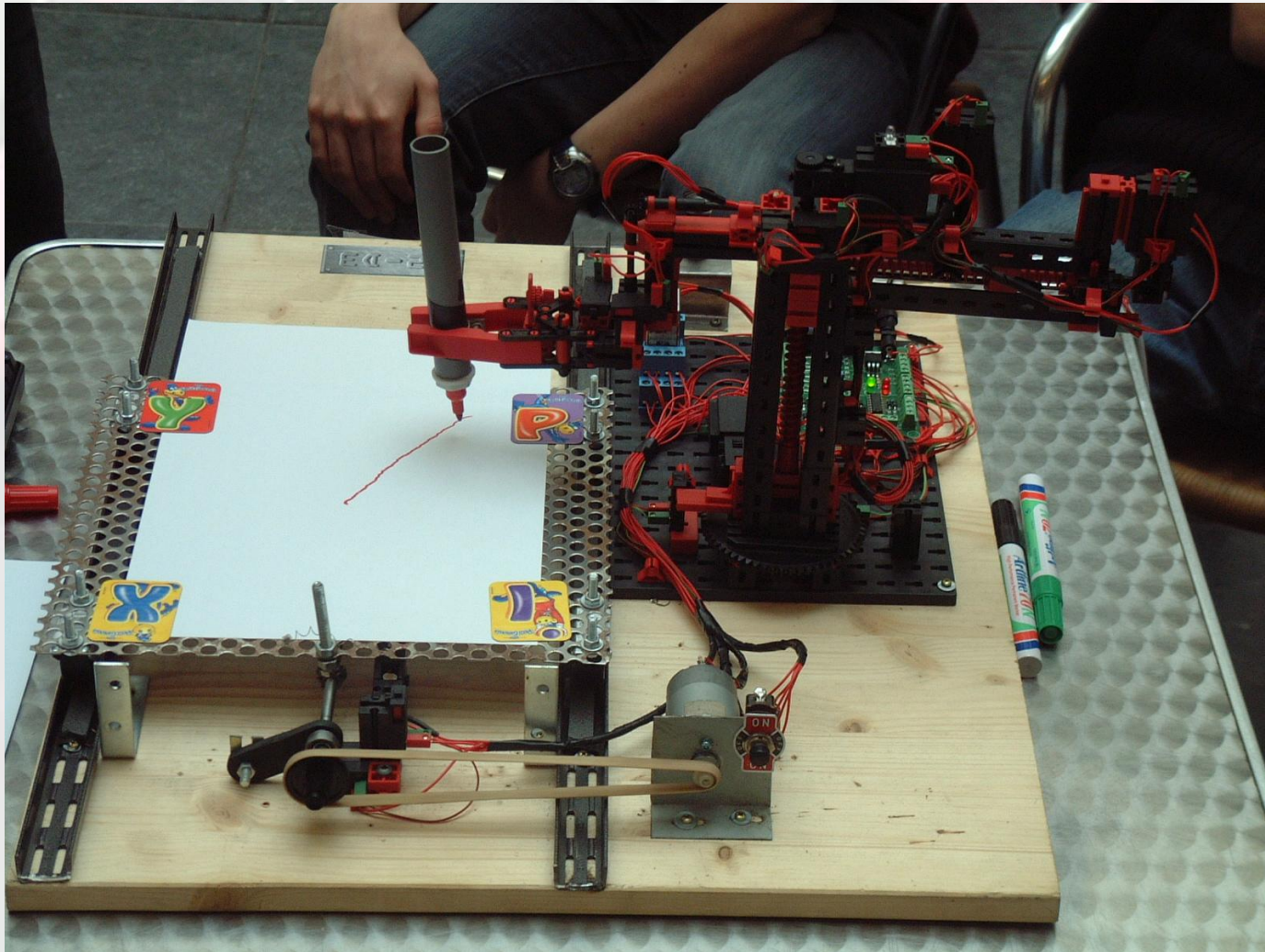
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Pick and place



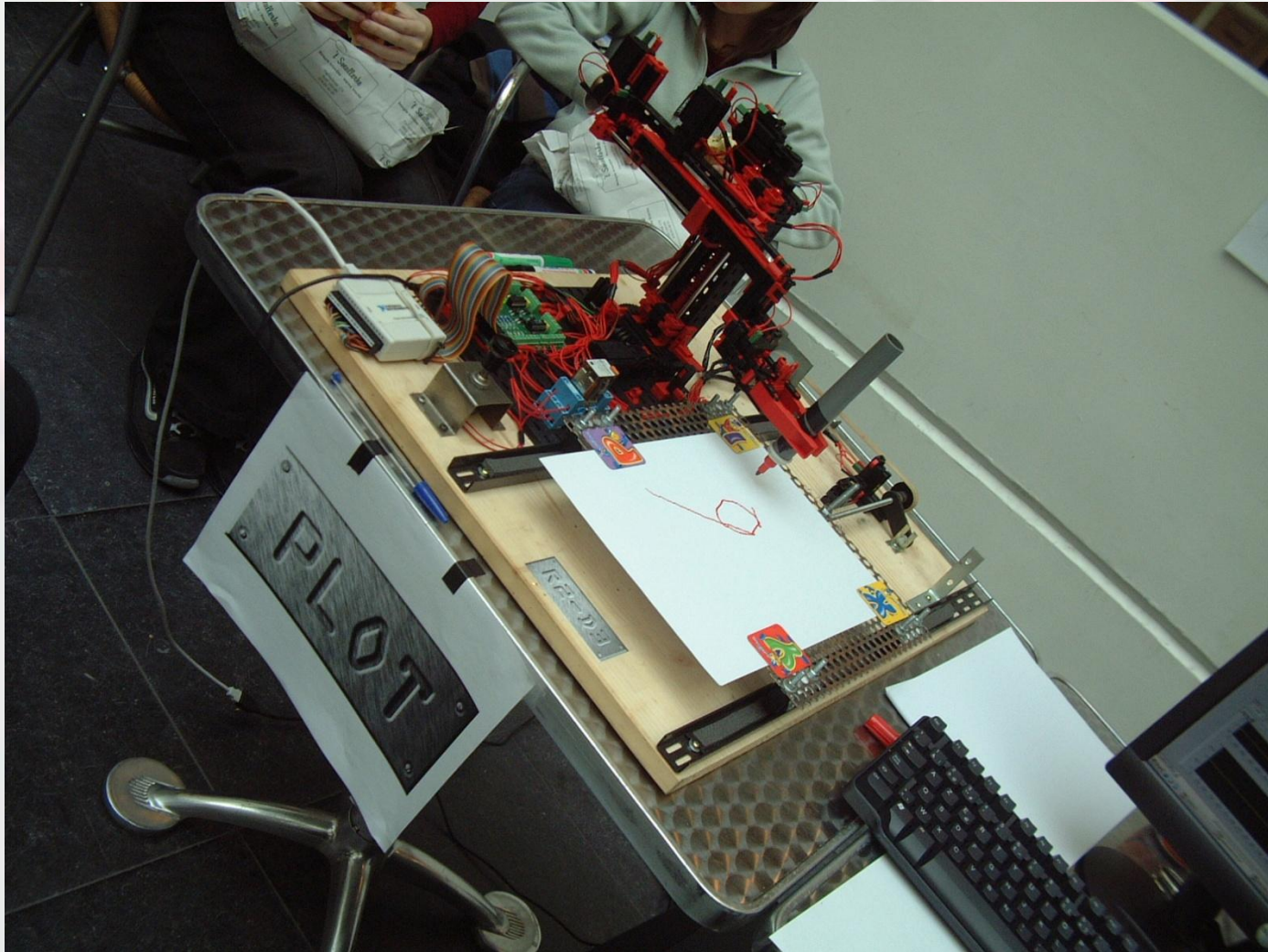
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Plotter



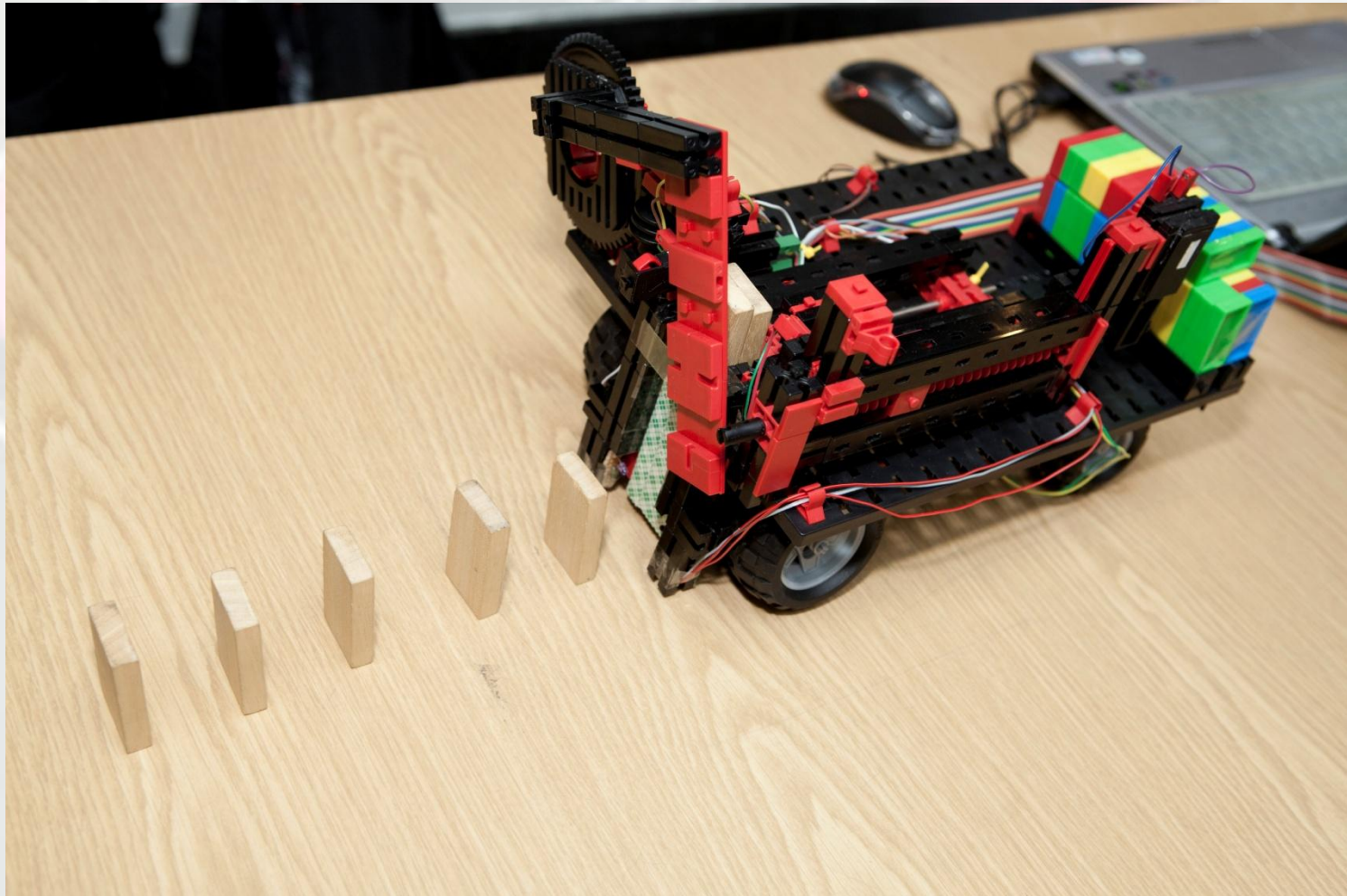
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Plotter



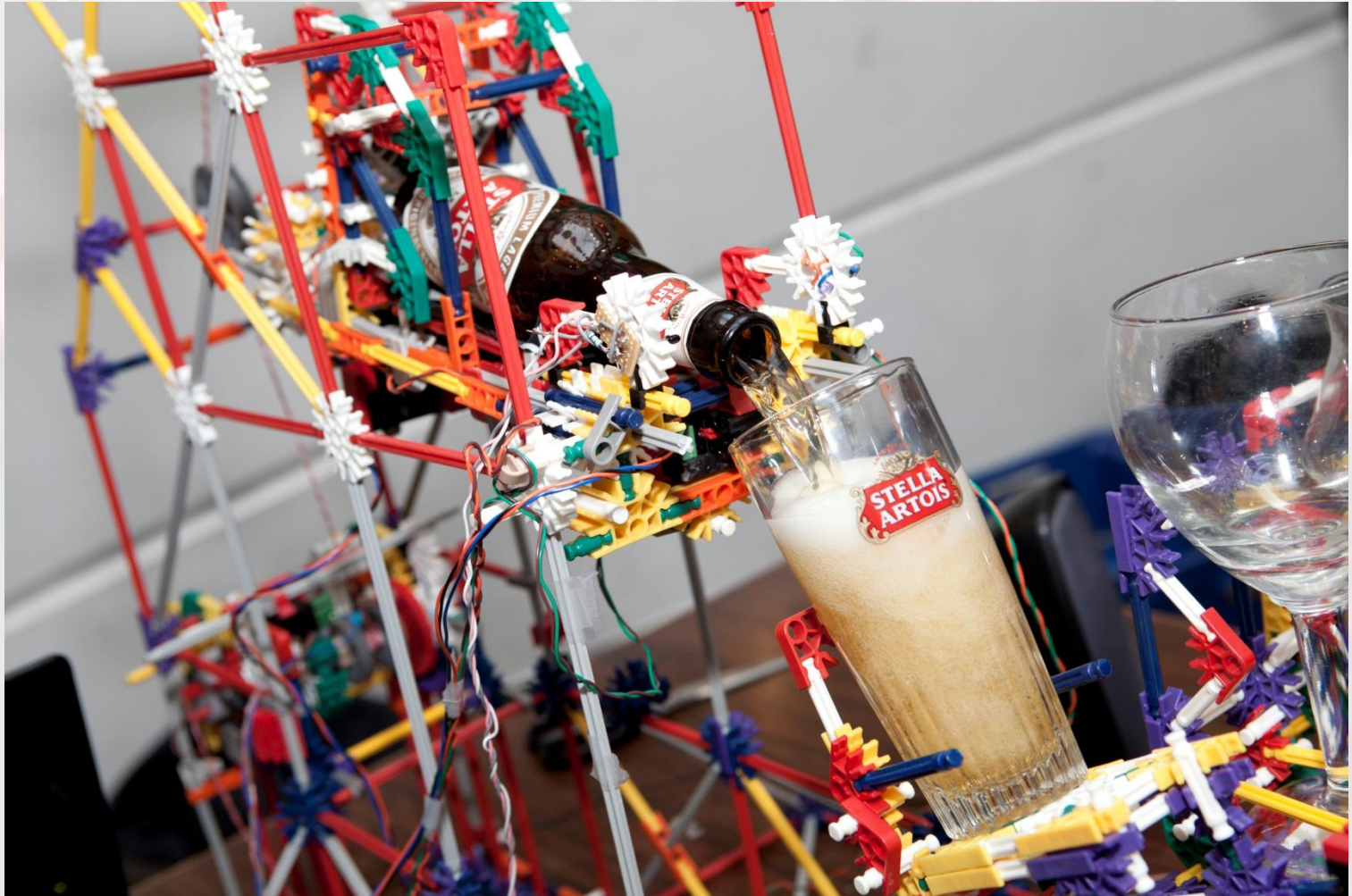
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Placing domino



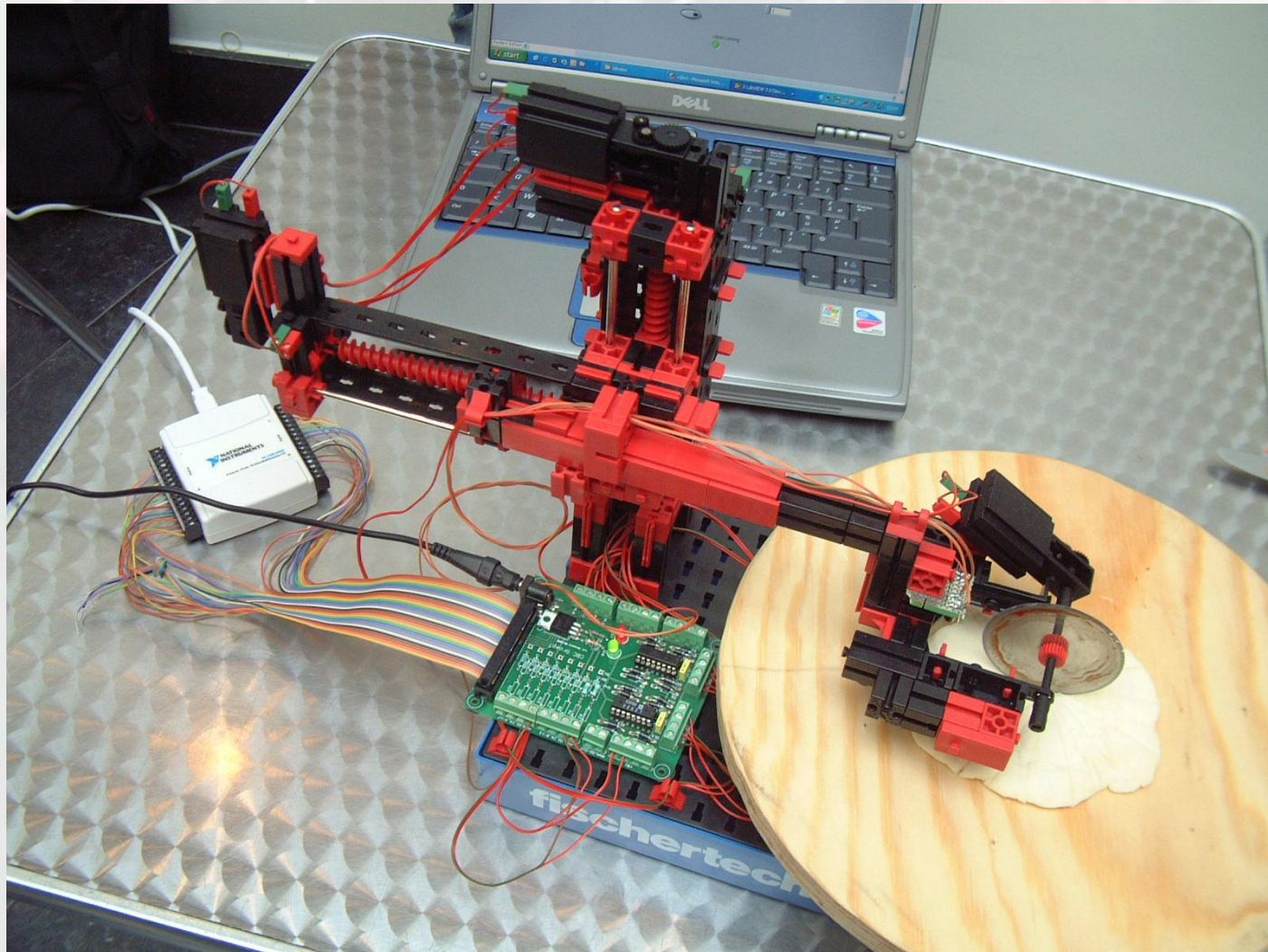
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Drawing a perfect glass of beer



Engineering Experience 3: Computer Based Control

Pizza cutter

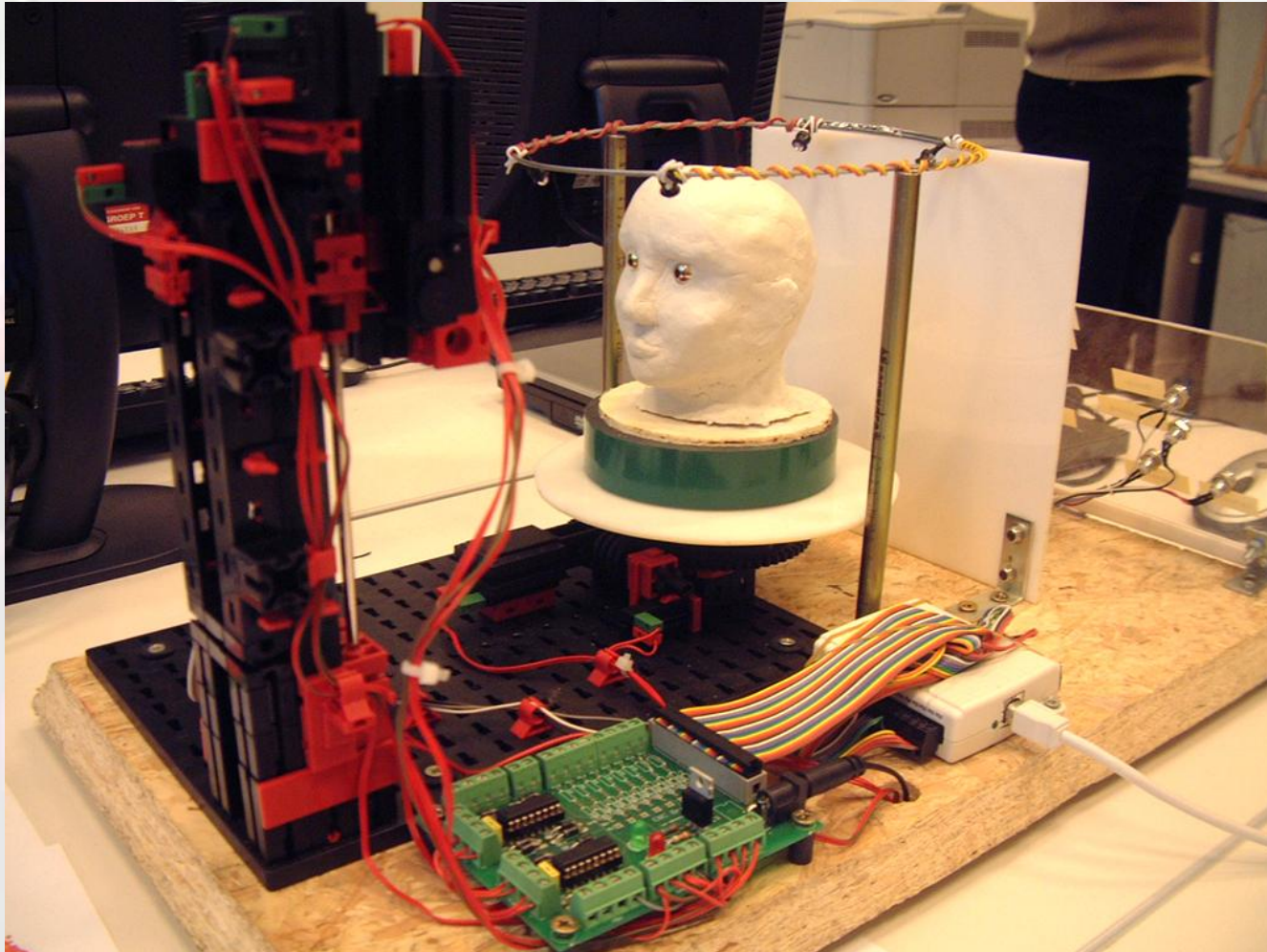


Engineering Experience 3: Computer Based Control Competition



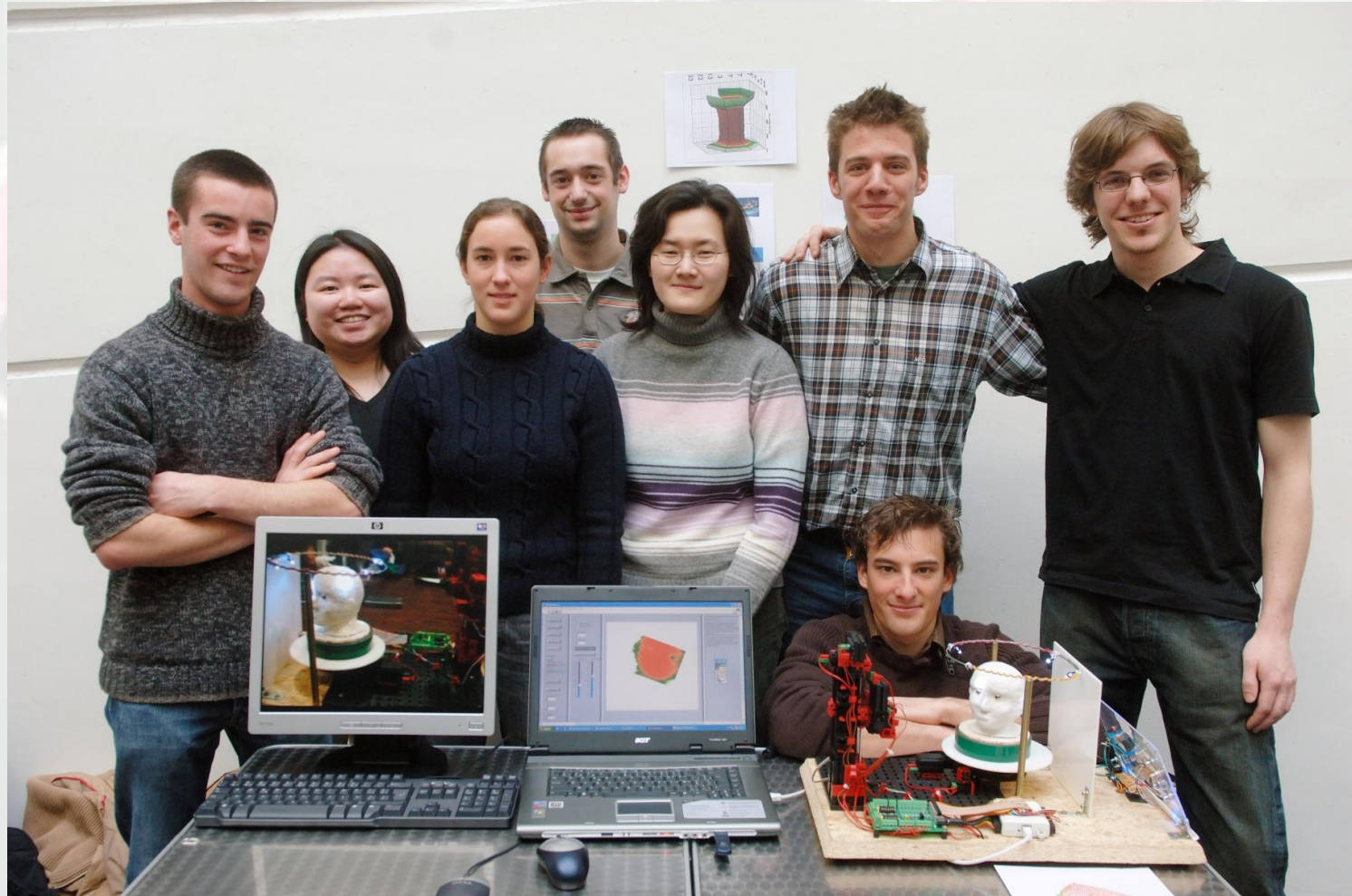
Engineering Experience 3: Computer Based Control

Winning team: 3D scanner



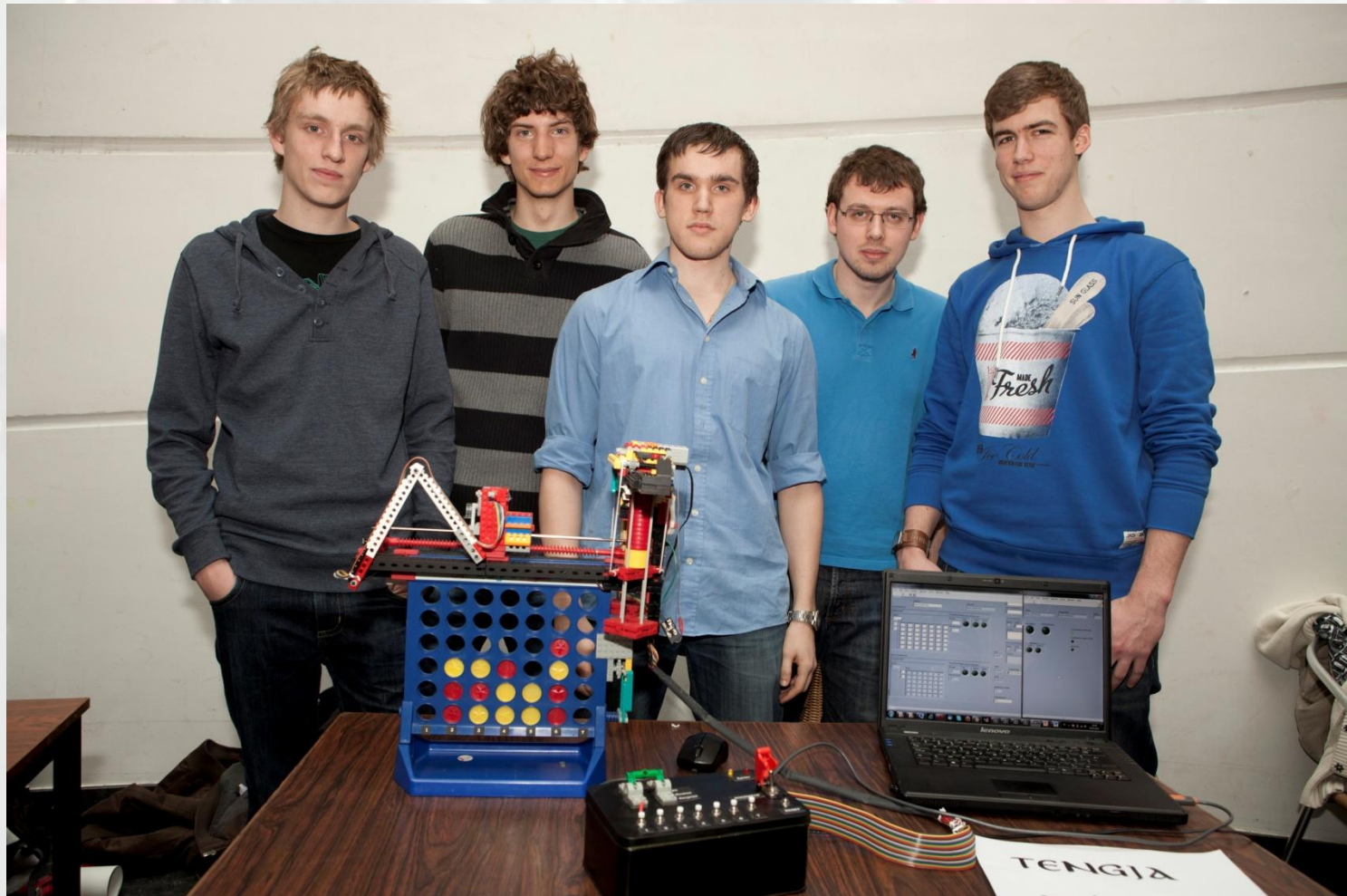
Engineering Experience 3: Computer Based Control

Winning team: 3D scanner



Engineering Experience 3: Computer Based Control

Winning teams: 4 in a row



Evaluation of the project

■ Opinion of students:

👍 Intuitive software: Low “step in” effort.

👍 “reading” of sensor signals and “writing” to motor is easy

👎 Spending more time than planned
(too enthusiastic?)

Evaluation of the project

- **Opinion of professors:**
 - **Lack of “Real programming” skills**
 - Lot of students never programmed
 - A lot of “chaotic” programs
 - Not everyone in the team is equally busy programming, some even not at all.
 - Due to chaotic programs: difficult to evaluate

Evaluation of the project

- Opinion of professors:
 - New this year to improve structure in programs:

Including seminar on

“Finite State Machine” programming
and an application in the LabVIEW
workshop

GROUP **TT**

LEUVEN ENGINEERING COLLEGE



Questions?