Possible Girls' Day Robots
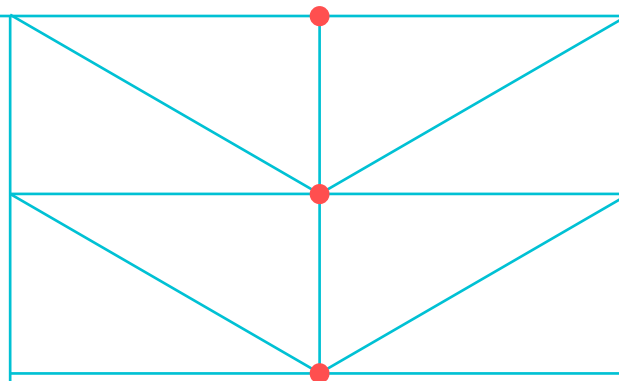
TUHH
Hamburg
University of
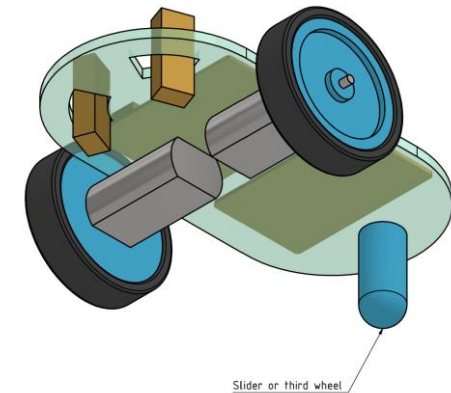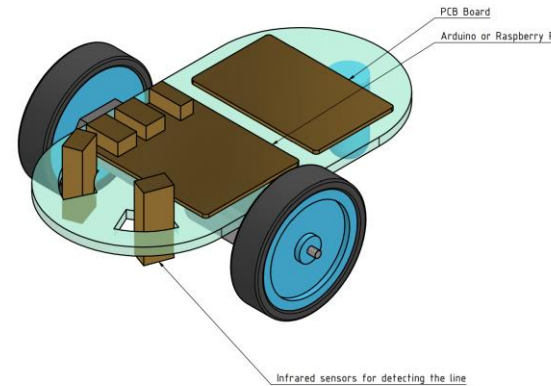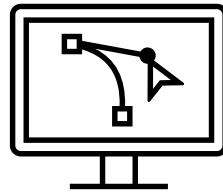Technology

06.03.2024

By Maximilian Finn Lüders

Self Driving Robot

- Idea: A simple self driving robot follows black lines on the ground
- Features
  - Laser-cut chassis
  - Printed 3rd wheel solution, rims and more
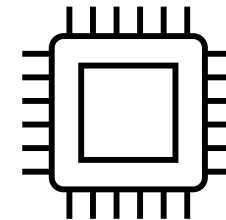 - Double H-bridge DC-motor control
  - Simple feedback through sensors

PCB Board
Arduino or Raspberry Pi
Infrared sensors for detecting the line
Slider or third wheel

Design Team
- Chassis (laser-cut)
- Wheels/rims
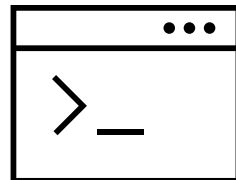- 3rd support point
- Mounting for sensors

Electrical Team
- Double H-bridge
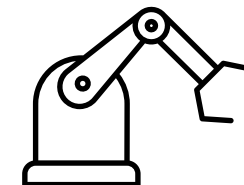- Connection of components
- LEDs and switch

Programming Team
- Indicator LEDs
- PWM motor control
- Calibrate sensor
- Following the line

Assembly Team
- General layout
- Overseeing
- Assembly

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Self Driving Robot

- Needed components
  - Arduino or Raspberry Pi
  - 2x small DC motor
  - 2x Infrared sensor
  - 2x ADC (if necessary)
  - PCB board
  - Cables (some with pin connectors)
  - Wheels
  - Battery pack and connector
  - Switch
  - LEDs

- To prepare:
  - Mounting parts
  - Back-up chassis plate
  - Back-up H-Bridge
  - Reference values for sensors and motors

- Possible bonus task: Solving a maze
  - Possibly with graphical programming

- Layout H-Bridge:
 - https://www.instructables.com/H-Bridge-Motor-Driver-for-Arduino-Using-Transistor/

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Simplified Drawing Robot

- Idea: Robot holding a marker finds marked spots and draws prepared symbols
- Features:
    - Laser-cut structural parts for the arm
    - 3D printed mounts for the marker and a small servomotor
    - Feedback controlled joint motors
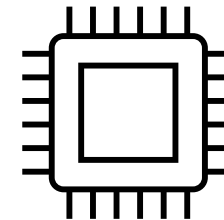   - Angle-to-position calculation
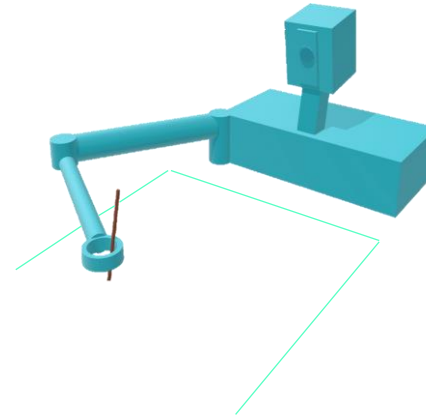
Design Team

- Marker lifting end effector (~2 parts)
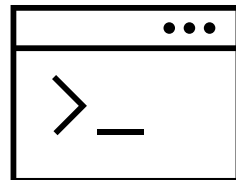- Structural parts (laser-cut)
- Attachment to the table
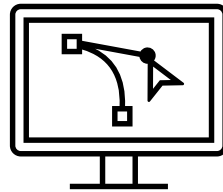
Electrical Team

- Connection of components
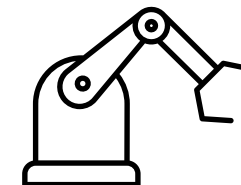- Cable management
- LEDs and switch

Programming Team

- Indicator LEDs
- Feedback motor control
- Angle to position calculation

Assembly Team

- General layout
- Overseeing
- Assembly

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Simplified Drawing Robot

- Needed components
  - Arduino or Raspberry Pi
  - 2x medium servomotor
  - 1x small servomotor
  - Servomotor controller with feedback (if necessary)
  - Infrared sensor
  - ADC (if necessary)
  - PCB board
  - Cables, switch and LEDs
  - Marker
  - Paper A5
  - Power Supply

- To prepare:
  - Mounting parts (maybe back – up)
  - Joints
  - Feedback control (maybe back-up)
  - Sub-programs for writing/drawing

Comparison

Self Driving Robot

- Pros
  - Simple project
  - Interesting design task
  - Less costs and less preparation needed
  - No structural difficulties
  - Mostly developed by the kids

- Cons
  - Very "typical" beginners' project
  - Correlation to real development might be missing

Simplified Drawing Robot

- Pros
  - Similar to a real project
  - Learning about simple feedback control
  - Mathematical challenge in angle-to-position calculations

- Cons
  - More preparation needed
  - Stability of the arm must be achieved
  - Mathematics might be to advanced
  - Only a few tasks for the electrical team

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-> Given the short time on the day itself as well as for the preparation, the self driving robot would be the safer option. The payoff for each task might also feel greater in this project

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General Ideas and Questions

Ideas

- Wireless connection to a Raspberry or other controlling unit to allow for faster programming
- Graphic programming(?) (maybe for advanced functions?)

Open Questions

- Which programming language do we use?
- Are the printers fast enough?

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