Week 3

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This Week: Polish the idea

- **Narrow down from 3 ideas**
  - Further define the previous three questions
    - Need
    - Novelty
    - Solution
- **Quantify the metric**
  - Describe the sustainability of your idea in a quantifiable way, think of the 6 Rs;
  - Scope;
- **Approaches**
  - Sensors and designs;
  - How to close the loop?
  - Is it doable in 10 weeks with a reasonable cost?

How to quantify and benchmark

Fit into 6 Rs

- **Recycle**
  - Recycling Rate: Mechanical engineers can design products for easier disassembly, repair, and recycling, improving the overall recyclability of materials.
  - Recycle the resource
    - Energy
    - Water
    - …
- **Repair**
  - Interchangeable design that can be easily repaired?
  - Easily disassemble?

How to quantify and benchmark

Fit into 6 Rs

- **Reuse**
  - Parts/materials that can be disassembled and reused for other devices?
  - Parts/materials are directly reused from other machines?
  - Modular design that can be reused directly for other functions?
- **Reduce**
  - Improved design to reduce the use of materials?
  - Reduce the environment impact?
    - Energy usage
    - Toxic pollutions
    - Noise emissions
- **Refuse**
  - Robust design that can last longer?
  - Lifecycle improving?

How to quantify and benchmark

Fit into 6 Rs

- **Rethink**
  - For a greater good
    - Human health impact
    - Fair Labor
    - Society / culture impact
    - …

How to quantify and benchmark

Quantify and benchmark your device

- **Actuation**
  - How much force / speed / torque is required to achieve the designate motion?
  - Does the size of the selected actuator fit in the design?
  - Is it commercially available?
- **Sensing**
  - What signals are needed to close the control loop?
  - What sampling rate is needed to achieve specified function?
  - Precision requirement?
- **Control**
  - How is the control rate required for achieve designed functions?
  - Selected actuator and sensor support this rate?
  - Communication protocol needed?

How to quantify and benchmark

Quantify and benchmark your device

- **Power**
  - Power required for actuators?
  - Is it practical for the designate application?

- **Manufacture**
  - What material will be used?
  - How the structure / mechanism will be designed?
  - What manufacture methods will be used?
  - Simulations (CAD / FEA / CFD) for validating the design?

By next week

Polish the idea

- **Detailing the idea**
  - Create quantifiable metrics
  - Specify the desired functions

- **Detailing the design and part selections**
  - Select sensors
    - First purchase day coming: Oct. 2nd
  - Design on structures and transmissions
    - Actuators
    - Control loop
    - Power plan
    - Manufacture plan
  - How to improve for sustainability?

1st /3 Order

Deadline: Oct. 2nd

Total budget: ~ 150 CHF

Venders:

Digikey.ch
(Electronic components)
(Mixed/specialty electronics, motors)

mouser.ch
(Mixed/specialty electronics, motors)

digitec.ch or galaxus.ch
(General components)

distrelec.ch
(Special Electronic components)

uk.misumi-ec.com/
(Materials)

tme.eu
(Electronic components, motors)

uk.rs-online.com
(Development shields and other components)

How to order

- Google Sheet order form will be sent out later
  - Orders due by 15:00 on the dates (strictly)
  - Will place orders that afternoon
- Will only process valid components
  - Parts *must* come from the previous suppliers
    - e.g., **digikey.ch**, *not* digikey.com
  - Part numbers must match their description or link
- Form will track budget for each group

Shipping considerations

- Groups will be charged for shipping, unless:
  - Total from all groups over “Free shipping amount”
- Example:
  - Group 1 wants components from Mouser.ch, <54 CHF
  - Group 2 wants from Digikey.ch, <60 CHF
  - Group 1 changes their order to Digikey
    - The order is now over 60 CHF, and the shipping will be free for both groups
- Work with other groups!
- Note: Distrelec has free shipping to EPFL