**Project plan**

***SSI-Disassembly***

*Fontys Innovation Lab*

***Eindhoven***

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#### Version

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**Communication**

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# Project Assignment

## Context

Disassembly is about separating products, to get a product decomposed in its parts. It is a phase when remanufacturing, refurbishing or recycling a product. We perceive disassembly as an vital activity when reducing dependencies on critical raw materials and to reduce carbon footprint of manufacturing.

My company observed that companies in the manufacturing industry are faced with the challenge of making their production and materials more sustainable. Sometimes the disassembly of a product is perceived as easy when part are just clicked together. Sometimes the disassembly is more difficult when parts are glued together, and also when thinking about how to determine and guarantee the status of the product components. So it’s up to the innovation lab to research what the technical possibilities are to this issue.

## Goal of the project

and materials more sustainable. One of the activities is the disassembly of products. Disassembly is taking products apart. Disassembly will become an important activity for the manufacturing industry because of the scarcity of materials and legal developments as the EU Net Zero Act.

Disassembly of a product is defined as the phase starting at the End of life of the product or product part. Disassembly is a phase recycling of a product, before the product is processed for remanufacturing, repair, reuse and/or refurbishing. The research group HTES is developing an smart disassembly line for this purpose. The line encompasses different steps.

Afbeelding met tekst, schermopname, Lettertype, Rechthoek

Automatisch gegenereerde beschrijving

The disassembly line requires a vision system; especially to conduct the steps: classification, identification, inspection, registration and sorting.

## The assignment

Design and implement a vision system for the disassembly line. The assignment examines, a.o.:

* the conditions needed for the vision system, e.g., taking elements like distance to the object,
* how to do the pattern matching of the specified product part
* the required vision approach; with aspects like 2D, 3D, AI, ….
* the required camera setup; e.g. RealSense, ZED3, …
* the actions that can be enabled by the vision results, e.g., vision information needed to grab a product part.
* How to store the vision data?

The result is the setup of a vision system, that is applicable as a demonstrator that enables the detection of pre-defined product parts, e.g., by entering a CAD-file or photo, in a set of other identified goods.

The demonstrator will show that a ‘random’ product part, e.g., a magnet or print

## Scope

|  |  |
| --- | --- |
| **The project includes:** | **The project does not include:** |
| 1. Computer vision research | 1. Manipulation |
| 1. Demos of certain computer vision methods | 1. Dismantling |
| 1. Classification | 1. Storage |
| 1. Identification | 1. Sorting |

## Finished products

* Multiple smaller prototypes that can be easily demoed
* A research to see which method(s) of computer vision works the best
* A bigger prototype of the best method

## Research questions

**Main question:** What computer vision methods demonstrate the highest success rates in accurately detecting and recognizing newly introduced products?

**Subquestion 1:** How does the time efficiency of setting up computer vision for product detection vary across different methods, especially considering the effort required in uploading and annotating large datasets?

**Subquestion 2:** How do different computer vision methods vary in their ability to recognize and differentiate between subtle visual cues, contributing to their skill in accurately identifying new products?

**Subquestion 3:** What potential challenges or limitations might arise when applying computer vision to identify novel products, and how do various methods address these issues?

# Approach and Planning

## Approach

I am going to use scrum but because I am not working directly in a team I won`t have daily standups but weekly standups. I will also have a weekly stakeholder meeting where and every 3 weeks a sprint review.

### **Test approach**

I am going to use a code review method to see if my code works well. I am also going to use unit tests and create a test plan where I make certain requirements that a code should do.

## Research methods

I am going to use the DOT framework with the following methods: Available product analysis, Best good and bad practices, Expert interview, Benchmark testing, Prototyping and product review. I might add some extra methods if needed.

## Learning outcomes

Communication: I will complete this by keeping my stakeholder and lectors up to date what I am doing and requesting help when needed

Planning: Through using SCRUM I want to make sure everything is planned well and gives me the freedom to change it every 3 weeks if needed.

Research: A big part of my project is researching and I will do this through using the DOT framework  
Computer vision: The research is all about computer vision also my demos/prototypes will be demos/prototypes of a computer vision product. Through these processes I hope to learn a lot more about computer vision.

## Breakdown of the project

Sprint 1: Research the possibilities and see what has been done and what might work. Then talk with my product owner and show me my findings and then make a more specific research on certain possibilities.  
Sprint 2: Create some demos from the findings I found.

Sprint 3: Do some testing with the demos to find the best solution in practice and theoretically.  
Sprint 4-6: Make a prototype of the best solution.  
Sprint 7: Finish up the project for showcasing.

## Time plan

|  |  |  |  |
| --- | --- | --- | --- |
| **Phasing** | **Effort** | **Start** | **Ready** |
| 1. Theoretical research | 1 sprint | Sprint 1 | Sprint 2 |
| 1. Creating demos | 2 sprints | Sprint 2 | Sprint 3 |
| 1. Creating prototype | 3 sprints | Sprint 4 | Sprint 6 |

# Project Organization

## Team members

|  |  |  |  |
| --- | --- | --- | --- |
| **Name + Phone + e-mail** | **Abbr.** | **Role/tasks** | **Availability** |
| Teade Punter, +31 6 57934696, teade.punter@fontys.nl | Lector High Tech Embedded Software (HTES) | Product owner + Company supervisor | 4 days a week |
| Edwin van den Oetelaar, oetelaar.automatisering@gmail.com | Lector High Tech Embedded Software (HTES) | Second product owner | 5 days a week |
| Pim Veroude, +31885076624, p.veroude@fontys.nl | Lecturer-researcher​ | Second company supervisor | 5 days a week |

## Communication

I have a weekly meeting with every Team member to discuss about what I have done the past week and what my plans are for the following week. Some team members I speak more often for help and information, these team members are Edwin and Pim. I also will be using SCRUM to show on an organised way what I am doing every 3 weeks and what my overall plan is for the semester.

## Test environment

My test environment is the make lab and create lab. Here I have a camera`s and possible objects to test my computer vision system on.

# Finance and Risks

## Cost budget

Only thing I am using from my company is a Lenovo Thinkbook that costs around 699. But this is borrowed from the ISSD so the innovation lab doesn’t need to spend it themselves.

## Risks and fall-back activities

|  |  |  |
| --- | --- | --- |
| **Risk** | **Prevention activities included in plan** | **Fall-back Activities** |
| 1. Company supervisor gets sick for a long time | n/a | Contact fontys for a new company supervisor |
| 1. I get sick for a long time | n/a | Contact fontys for extension of internship |
| 1. Robot arm stops working | Being careful with the robot arm | Ask the product owner for a new robot arm |
| 1. The camera for vision breaks | Make sure my code works on multiple camera`s | Request a new camera from the ISSD |
| 1. My laptop breaks | Set my code on git | Get a new laptop and pull my work from git |