Abstract

This is the homework for a course for bachelor students in systems engineering for the part architectural reasoning.
Monday January 16, 12:00 lecture, 13-16 class work
Thursday January 19, 11:00 lecture, 12-16 class work
Monday February 6, submit homework 1
Monday February 13, 12:00 lecture, 13-16 class work
Thursday February 16, 11:00 lecture, 12-16 class work
Monday March 7, submit presentation of homework 2
Monday April 4, submit individual reflection report of homework 2
Specify and design

an autonomous track/road maintainer for elderly Norwegians.

This robotic vehicle, amongst others, keeps the drive to their home fully operational (in winter).
Use time-boxes of 15 minutes and perform the following steps:

- Sketch the system-of-interest and its immediate context
  - Annotate the sketch (e.g. main components, interfaces, functions, …)
- Draw an initial design
- Make a specification of the system-of-interest (view it as a blackbox)
  - What functionality, performance, interfaces, standards or regulations
- Identify the main customer stakeholders and their concerns
- Identify the main life cycle stakeholders and their concerns
- Review and make a plan to consolidate in a presentation
Class-work Day 1 mapped on CAFCR

Customer objectives
Application
Functional
Conceptual
Realization
Life cycle

1. sketch the system-of-interest and its context
2. draw an initial design
3. make a specification
4. identify customer stakeholders
5. identify life cycle stakeholders
Start second iteration by elaborating FCR views

Use time-boxes of about 30 minutes

- Decompose the system in subsystems, decompose one subsystem in subsubsystems.
- Show the subsystems and interfaces in a block diagram
- Make a functional model of the internals of the system-of-interest
  - Use one or more diagrams to show the dynamic behavior
- Define 5..10 Key Performance Parameters of the system-of-interest
  - Define a use case to support the definition of KPPs
- Make a technical budget for one of the key performance parameters
- Review and make a plan to consolidate in a presentation
1. sketch the system-of-interest and its context
2. draw an initial design
3. make a specification
4. identify customer stakeholders
5. identify life cycle stakeholders
6. partitioning and interfaces
7. make functional design
8. define key performance
9. make performance budget
Homework after Day 2

Transform your results in electronic form (e.g., PowerPoint or Visio)

Develop two alternative solutions/concepts

Compare the three solutions using a Pugh matrix

  define 5..10 criteria for comparison

  score the solutions on a scale from 1 (poor) to 5 (very good)

Make a list of questions triggered by the first iteration

Search for facts to ease the next class-work
Home work instructions

presentation

filename: BSEAR team<your teamnumber> homework<number>

   e.g. BSEAR team1 homework1.ppt

all team members on front page

email to: <gerrit . muller @ gmail . com>

cc: Jamal

subject: homework SESDteam<your teamnumber> homework<number>

from/cc: <all email addresses of team members>
Continue second iteration by elaborating CA views

Use time-boxes of about 40 minutes

- Develop a story that helps you to understand the customer better and that facilitates analysis of specification and design
  - Verify your story against the story criteria
- Develop a customer key driver graph
  - Start with Key Performance Parameters and ask “why (is this needed)” repeatedly.

Use time-box of about 20 minutes for the remaining task

- Make a context diagram
Class-work Day 3 mapped on CAFCR

- **Customer objectives**
  1. sketch the system-of-interest and its context
  2. draw an initial design
  3. make a specification
  4. identify customer stakeholders

- **Application**
  5. identify life cycle stakeholders
  6. partitioning and interfaces
  7. make functional design
  8. define key performance

- **Functional**
  9. make performance budget
  10. develop 3 alternate solutions

- **Conceptual**
  11. determine 5..10 criteria for comparison
  12. rank 3 alternate solutions against criteria

- **Realization**
  13. Make a Story
  14. Customer Key Driver Graph
  15. Context diagram
Continue second iteration by elaborating life cycle view

Use time-boxes of about 30 minutes

- Develop a business plan for your company
  - determine your role in the value chain
  - determine income, expenses, and investments
  - estimate cash flow as function of time
- Identify needs and concerns from life cycle stakeholders
  - determine life cycle key drivers and key performance parameters
- Make a Cost of ownership estimate for customers
  Use time-box of about 20 minutes for the remaining task
- Make a schedule for development and start of deployment
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<td>17. needs and concerns</td>
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T-shaped Presentation

- **societal trends**
- **opportunities**
- **problems**
- **needs**
- **business/market competition trends**
- **opportunities**
- **problems**
- **needs**
- **customers stakeholders**
- **key drivers**
- **concerns**
- **applications**
- **product project system**
- **functions**
- **key performance**
- **design and concepts**
- functional, physical quantified
- **specific aspects**
- functional, physical quantified
- **technology**
- critical or new

- business quantification
- risk analysis
- conclusions and recommendations

- summary how solution answers needs
- summary and conclusions why choices are appropriate
- why choices are appropriate

Bachelor Course Systems Engineering: Architectural Reasoning; Homework version: 1.4
Gerrit Muller
Check specification and design for major gaps or improvements

Transform your results in electronic form (e.g., PowerPoint or Visio)

Make a T-shaped presentation for your management; its main purpose is to take a go/no-go decision

Write an individual reflection report, max 2 A4s:

What are your main learning points?

What aspects deserve most attention in next phase of your project? Explain why.
Specify and design an
Unmanned Humanitarian Response/Support Vehicle,
which will be able to reach locations with
poor, bad, or destroyed access.
Specify and design a full-electric TukTuk (versatile, urban, no emission)

http://en.wikipedia.org/wiki/Auto_rickshaw#mediaviewer/File:DKoehl_colombo_auto_rickshaw.JPG by Dan Koehl, license: http://creativecommons.org/licenses/by/3.0/
Specify and design a full-electric drive-by-wire race kart