Secret Plan - Verification and Evaluation Workshop

ENGN2225 Systems Engineering Design

Take-home Message

SE verification and evaluation techniques give you a systematic way of choosing one design option over another

SMART+ Goal

For students to develop a plan for testing and verification and make a decision about a design using an evaluation matrix

Start-5 - Introduction - Maria

- Handout chocolates, write up schedule
- Introduce group members
    - Ask for E&V definition from class
    - Give a brief description of E&V
    - State take-home message
    - Summary of schedule for the hour

5-15 mins- Verification Theory- Jennifer

- [5mins] Verification theory
    - Definition of verification
    - Explain each of the 5 stages of testing
        - Relate to attributes cascade: primary, secondary, tertiary attributes.
        - Give examples of attributes to test with analytical, proof-of-concept and prototyping
    - When to perform testing?
        - All throughout testing, to gain confidence system requirements are being met
        - V-Model – mention building resilience in a system design
- [5mins] Explain case study: *The city of men is under attack! Gandalf knows you have done ENGN2225 so he has chosen you (a military engineer) to design a catapult. You have designed five prototypes and now you must test them to find the best one.*
    - Go through customer requirements
        - Pairwise and TPM

15-35 mins Verification Application - Peter

- [2.5mins] Formulating testing methods
    - Simple procedure example
        - Define which attribute you are testing
        - The qualifications required to perform the testing
        - A repeatable procedure that anyone can follow to obtain the same results
        - Pass/fail criteria
            - Show benchmark of our standard catapult
            - Show how benchmarks fit into House of Quality
- [2.5mins] Split project groups into 4 different groups
    - Give groups a few minutes to devise methods to test each design requirement
- [15min] Start testing activity
    - Groups must test at least 2 different catapults
    - Groups have about 5 mins to test each catapult
- Discussion
    - Ask groups what their testing methods were
    - Were their testing methods repeatable
    - Do they think different methods would affect results
    - Are the results qualitative or quantitative
    - Refer back to group projects and how its applicable
        - Mention Australian standards

35-45 mins- Evaluation Theory- Zhao

- [10mins] Evaluation theory

- Definition of evaluation and its purpose
- Types of Evaluation methods
  - direct ranking (weighted ranking), systematic elimination, comparison across alternatives , comparison across a standard, maximax, maximin, Laplace, Hurwicz
- Benchmarks (comparison across a standard)
- Evaluation matrix (weighted)
- Talk about how evaluation process relates to requirements, FFBD, design attributes
- Relate to group project
  - Compare how your design performs against different alternatives

45-55- Evaluation Application – Jason

- [5mins]Give groups evaluation matrix to fill in according to results from testing activity
- [5mins]Discussion
  - Ask groups which catapult came out with highest score
    - Discuss the different results from each group
      - Refer back to testing considerations
  - Refer to benchmark comparison and the evaluation method of comparison across a standard

55-60 Conclusion- Maria

- Session recap: E&V and activities
- Revisit take-home message

Activities to drop if over time

- Move on quickly by providing shorter shared answers in discussion
- Cut out the detail explanation of theory that is not as relevant

Activities to add if running under time

- Q & A
- At the end ask group how they think they will apply V&E to their project
- Change customer requirements and redo evaluation
- Ask group to use different evaluation method (systematic elimination) and explain the different outcome

Marking criteria

- Encourage participation of all tutorial members
  - Get people up and hands on activities
- Extent to which the facilitators build a shared understanding of the theory
  - Agreed understanding between facilitators, everyone leaves tutorial understanding how SE process works
- Extends the topic through the use of an engineering case study
  - Pick something that people can relate to and has something to do with engineering
  - Show how it's a problem people can solve
- Clear, logical progression of ideas which leads to an effective conclusion
  - Activities lead to SMART+ goal and take-home message