



Model Based System Engineering



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Customer Background

Los Alamos National Laboratory (LANL) Federally Funded Research & Development Center. They perform work for the Department of Defense (DoD), Intelligence Community (IC), and Department of Homeland Security (DHS), among others.

Problem Statement / Scope of Work

Create a model-based system Model DeWalt Electric Mower

Focus:

- How to use the Cameo
- Research on the mower
- Create the models in Cameo
- Test the model with constraints & satisfy functions

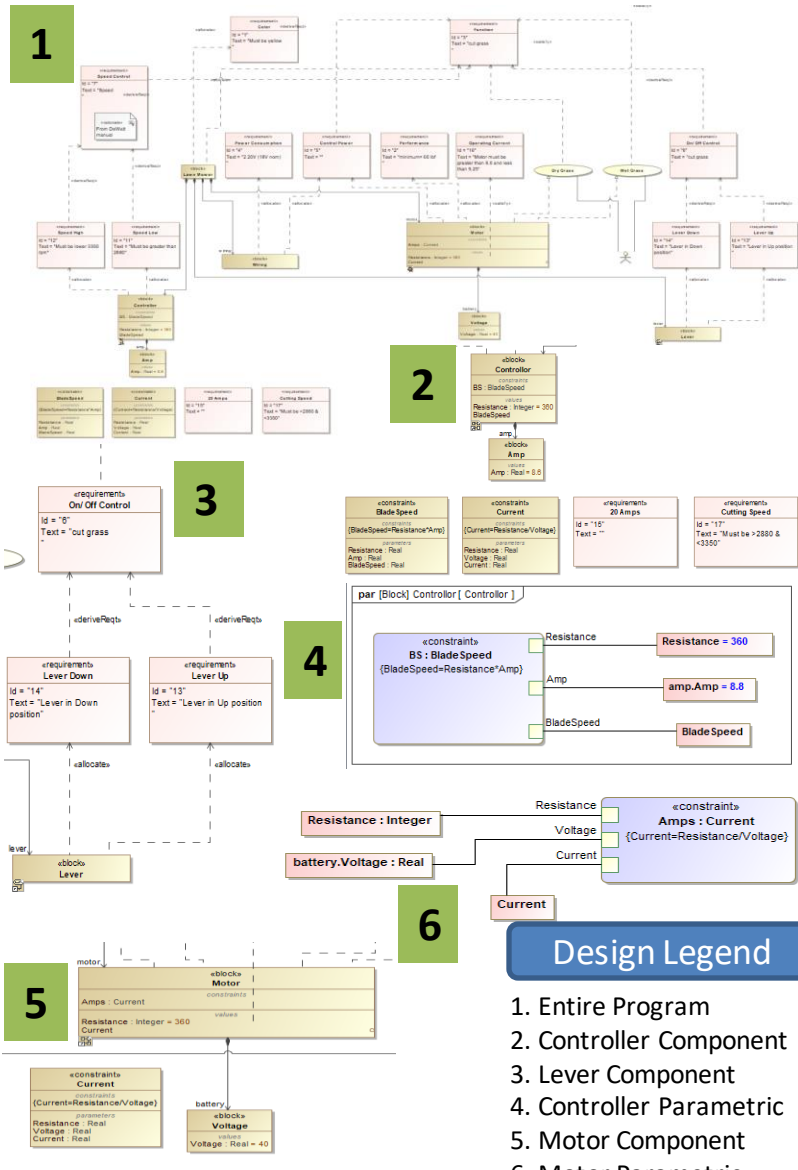
Requirements

- Repeatable & Adaptable
- Reduce Design Time
- Four Pillars of MBSE

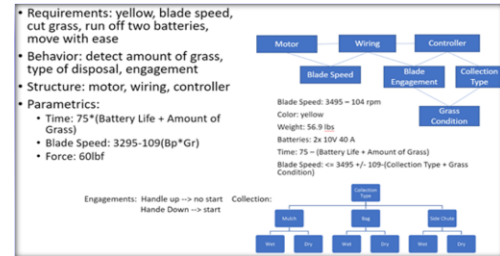
FMEA

System	PURDUE	POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (DFMEA)											
Item	Requirements	Failure Mode	Potential Effects of Failure	Potential Causes of Failure	Current Design Controls	Recommended Action(s)	Responsible	Start/Completion	Actions Taken	Effective Date	Open/Close	Imp	Req
1	Affordability Less than \$1000	Ball of material goes over \$1000 it would not meet the project requirements.	Will affect student budget	Cost of material may go over budget \$1000	Using cameo student version Budget limit	budget line	max	10/15/2021	Use budget therapy	11/3/21	0	1	0.0%
2	Digital assembly (cameo) Customer wants model to be able to show how MBSE can aid	ACCESS to magic draw or cameo could be limited	Will affect MBSE project	Software cost and license	Using cameo student version Budget limit	magic draw and purchasing cameo	max	11/3/21	Have proper lawn mower requirements and parameters	11/3/21	1	1	0.0%
3	Repeatable and modifiable	The model needs to repeat function ability each time a parameter is changed	Will affect MBSE cameo function	Having inaccurate parameters	Cameo Testing	Have proper lawn mower requirement and parameters	Kabre a	11/3/21	Have proper lawn mower requirements and parameters	11/3/21	0	1	0.0%
4	Provide instant feedback	The model needs to provide instant feedback	Will affect MBSE feedback	Having inaccurate parameters	Provide documentation/parameters for each	documentation/parameters for each	lydie	11/3/21	Have proper lawn mower requirements and parameters	11/3/21	1	1	0.0%
5	Must be able to cut grass	If mower is unable to cut because height of	Will affect MBSE	Having inaccurate	Have proper	Have proper	max	11/3/21	Have proper lawn mower	11/3/21	0	1	0.0%

Final Design



Concepts



Concept:

- Breakdown of a DeWalt lawn mower
- Include all the systems & interconnections
- Ability to input requirements & get different outputs based on the performance of the mower

Testing

Motor Testing Table

Resistance (Ohms)	Test Voltage (Volts)	Result Current (Amps)	Pass/Fail
360	40	9	Fail
360	41	8.78	Fail
360	42	8.57	Fail
360	43	8.37	Fail
360	45	8	Fail
360	50	7.2	Fail
360	37	9.7	Fail
360	38	9.47	Fail
360	39	9.2	Pass

Controller Testing

Resistance (Ohms)	Test Current (Amps)	Result Blade Speed (RPM)	Pass/Fail
360	8.6	3096	Pass
360	8	2880	Pass
360	8.3	2988	Pass
360	8.9	3204	Pass
360	9	3240	Pass
360	9.1	3276	Pass
360	9.2	3312	Pass
360	9.25	3330	Pass
360	9.3	3348	Pass
360	8.8	3168	Pass

Design Legend

1. Entire Program
2. Controller Component
3. Lever Component
4. Controller Parametric
5. Motor Component
6. Motor Parametric