FAMU - FSU COLLEGE OF ENGINEERING

Senior Design Team 310

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Targets & Metrics

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October 4th, 2019



Target Summary

Target values were assigned for each of the lowest level functions within our functional decomposition. Each of these target values were then given an individualized metric in order to allow future testing and validation. Following multiple internal and sponsor-based meetings, our team developed a complete set of targets and metrics, as well as outlined which of the target values we believe to be most critical to the success of the design. They are listed in Table 1 below. The remainder of the target and metrics are listed in the appendix.

Table 1: Critical Target and Metrics

|  |  |  |  |
| --- | --- | --- | --- |
| **Function Number** | **Function** | **Target Value** | **Unit of Measurement** |
| 1 | Resist High Voltage | 45 | kV |
| 5 | Separate Worker from Danger | 60 | Feet |
| 8 | Manipulate Wires in Complex Ways | 6 | Degrees of Freedom |
| 16 | Adheres to Company Standards | 0 | Infractions |

Success of the robotic line worker will be assessed off our ability to satisfy the complete set of target and metric values. The following list provides a more in-depth explanation to the values we believe are most critical at this point:

* *Function 1: Resist High Voltage* - The robot needs to be able to withstand forty-five kV because this is the maximum amount of voltage that may be present in an energized power line. If this is not satisfied the robot may incur damage from such high voltage and possibly injure the lineman operating the controls.
* *Function 5: Separate Worker from Danger* - The robot needs to be able to separate the worker sixty feet from the danger because safety is the top priority in this project. Furthermore, sixty feet was chosen because most power lines lie at this height, which corresponds to the worker being on the ground while operating the robot.
* *Function 8: Manipulate Wires in Complex Ways* - The robot needs to be able to move in six distinct degrees of freedom because this is the bare minimum amount of movement needed to be able to do complex motions such as unraveling wire and lifting protection material from the power lines.
* *Function 16: Adheres to Company Standards* - The robot needs to be able to adhere to the company standards and incur zero infractions. If the robot does not adhere to these standards FPL cannot use the design.

Multiple testing methods will be utilized to validate the established target values. These methods include high voltage test, leakage current test, wind tunnel test, and remote control capability. Local university facilities – such as the 5 Megawatt Prototype Test Room and Power Electronics Laboratory at the Center for Advanced Power Systems (CAPS) – serve as valuable resources for our team going forward.

Appendix

Table 2: All Target and Metrics

|  |  |  |  |
| --- | --- | --- | --- |
| Function Number | Function | Target Value | Unit of Measurement |
| 1 | Resist High Voltage | 45 | kV |
| 2 | Resist Wind | 35 | Mph |
| 3 | Resist Water | IPX4 | IEC Standards |
| 4 | Resist Heat | 322 | K |
| 5 | Separate Worker from Danger | 60 | Feet |
| 6 | Lift Heavy Objects | 50 | Lbs. |
| 7 | Remove Protection Material |  | Inches |
| 8 | Manipulate Wires in Complex Ways | 6 | Degrees of Freedom |
| 9 | Uses Different Power Sources | 3 | Modes of Power |
| 10 | Uses Light | 600 | Lumens |
| 11 | Operates for Long Periods of Time | 8 | Hours |
| 12 | Records Video | 1920 x 1080 | Display Resolution |
| 13 | Stores Video | 8 | Hours |
| 14 | Records Audio | 44.1 | kHz Sample Rate |
| 15 | Stores Audio | 8 | Hours |
| 16 | Adheres to Company Standards | 0 | Infractions |
| 17\* | Prevent Excess Strain on Truck Bucket from Project Weight | 300 | Lbs. |
| 18\* | Resist Arc Flash Events | 120 | Volts |
| 19\* | Adhere to Federal/State Electrical Standards | 0 | Infractions in Standards |

\*Additional functions not included in original functional decomposition