Concurrent Design of Automotive SMAs and Actuators, PSED Cluster 2009-2010

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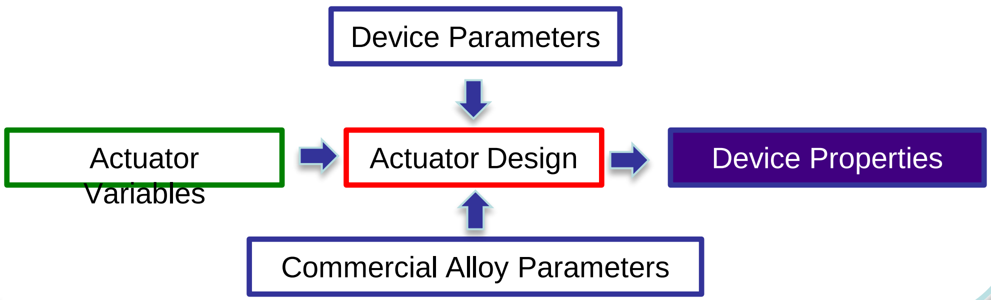
RESEARCH OBJECTIVE: To improve the design process of shape memory alloys (SMAs) and SMA actuators for the automotive industry.

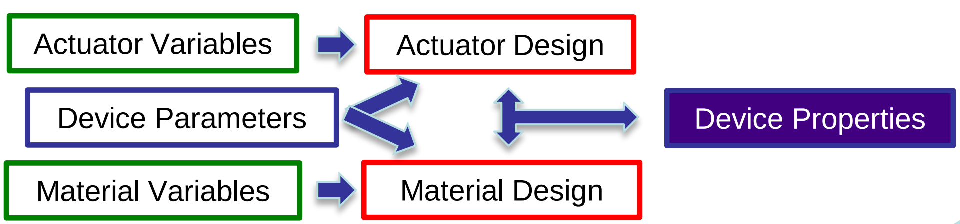
CURRENT DESIGN PROCESS

The Current design process is limited to the design of actuators using commercially available products; predominantly SMA wires with a maximum operating environment temperature of 60 ° C. Most automotive applications require functionality at temperatures of 85 ° C or greater and could benefit greatly from actuation structures, such as active beams and torque tubes, as opposed to wire.



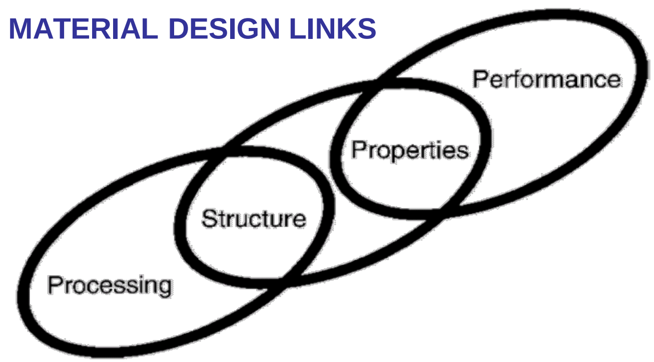
CONCURRENT DESIGN PROCESS

By bringing together alloy design and actuator design, the Concurrent design process allows for much greater freedom and optimization of SMA actuator systems. Issues of temperature and structural form can now be addressed through composition, processing, and manufacturing techniques, and device properties can also be controlled through these in addition to actuator variables such as operating loads and strokes.

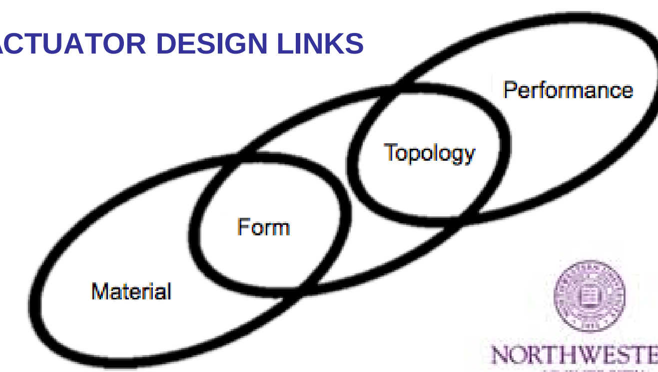


By developing and using computational tools that allow the engineer to predict material performance from composition and processing in material design, and system performance from material performance in actuator design, development costs and times are dramatically reduced and actuation systems are optimized to a much higher degree relative to existing SMA actuator development methods that rely almost completely on empiricism.

MATERIAL DESIGN LINKS



ACTUATOR DESIGN LINKS



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