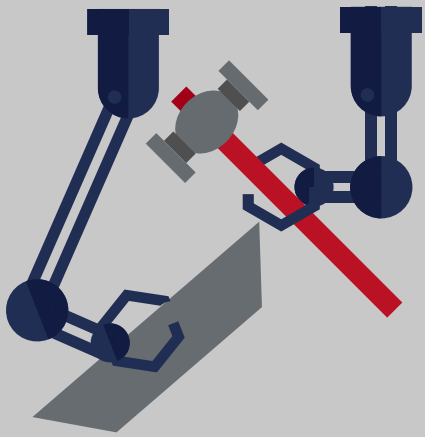
BUILDING 21ST CENTURY MANUFACTURING TALENT

The LIFT Prize in Robotic Blacksmithing: Igniting Student Interest in Manufacturing Skills and Innovation

An Education & Workforce Development Initiative for LIFT...Lightweight Innovations for Tomorrow



THE PROBLEM: MANUFACTURING TECHNOLOGY ADVANCING, WORKFORCE SUPPLY STAGNATING

Manufacturing has undergone a revolution around additive manufacturing, 3-D printers, and CNC machines. This keystone industry is more automated, requiring workers to have advanced technical and mathematical skills to program, run, and maintain complex machinery necessary for 21st century production. New manufacturing processes are emerging through LIFT and its partners such as agile processing which provides the opportunity to improve material properties, reducing waste and producing repeatable shapes while minimizing tooling and cost.

While this manufacturing renaissance is underway, fewer students are engaging in career pathways related to manufacturing, and employers are struggling to find the talent to replace their aging workforce. Currently, more than 21% of the advanced manufacturing workforce in LIFT's partner states is over age 55 and ready to retire soon. On top of this, employers in the LIFT partner states posted nearly 340,000 jobs during 2015 alone, but only 103,000 individuals completed degrees and certifications preparing them for these lucrative jobs. Postings continue to increase while sources of talent remain static. Demand is growing. Supply is stagnant.

COMPETITION: A NEW FRONTIER OF STUDENT ENGAGEMENT

To encourage students to develop the skills they need to become innovators and future manufacturing leaders, LIFT, through its Agile and Low-Cost Processing Pillar, has teamed with the Center for Design and Manufacturing Excellence (CDME) at The Ohio State University to initiate the LIFT Prize in Robotic Blacksmithing, a student competition using agile processing principles. The competition combines outreach to students, engagement with emerging cutting-edge technologies, employers working directly with students, prizes, and national recognition for the winning teams.

This competition merges the ancient skills of the blacksmith with the digital age of robotics to create new material forming capabilities called "Robotic Blacksmithing" for making useable object shapes. Like additive manufacturing and Computer Numeral Control (CNC) machining, Robotic Blacksmithing creates new methods for manufacturing, improving material properties, reducing waste, and agile manufacturing of complex and repeatable shapes with minimal tooling at low cost.

WHAT IS ROBOTIC BLACKSMITHING?

Instead of a blacksmith manipulating and forming materials by hammering, bending, twisting, or pulling, a robot is programmed to perform these movements and manipulations using a set of agile forming tools with greater efficiency and agility, and using far lighter and less expensive tools than might be used in traditional forging.

There are great opportunities for innovation in this new field to develop material forming models in a numerical or experimental modeling environment, and then translate these models into a robot environment to design and manufacture useful shapes. In the future, it is envisioned that Robotic Blacksmithing programming tools will be available to makers everywhere who seek to shape materials into objects. This technology can go beyond simple subtractive or additive manufacturing because the material can be improved by working it with deformation and heat, and sensors can record the process and assure properties. Most exciting, because the processes re-shape material, there is virtually no waste and a wide variety of materials can be processed to very high strength with other engineered properties.

Job Demand Outweighing Workforce Supply

340,000

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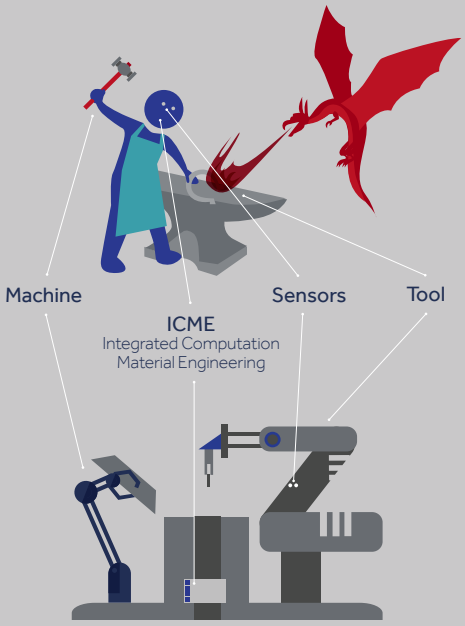
The Evolution of Robotic Blacksmithing



CONTINUING THE DIGITAL MANUFACTURING REVOLUTION

Robotic Blacksmithing follows on the heels of two revolutions in digital manufacturing have truly changed our world. The first was CNC, in which cutting tools process materials (plate, bar, and other wrought shapes) into more complex shapes. Instead of carving by hand, CNC machines use very large and fast metal removal tools, programmed with a digital 3-D model to subtract material from the block to create desired object features. The second manufacturing revolution was around additive manufacturing and 3-D printers, which add successive volumes of material by computer control to create complex shapes that are described by an electronic (digital) data source, such as a 3-D model. Our menu of processes and materials for additive manufacturing is expanding rapidly right now.

ELIGIBILITY

The program is open to any student team attending a U.S. high school, technical college, community college, college or university, and partnerships with regional or national companies are encouraged.

EXPECTED OUTCOMES

Students will benefit from this competition by:

- Developing and demonstrating a third robotically-controlled way of making things
- Inspiring innovation and new skills
- Showing the linkage between doing and innovation
- Showing innovation, skills, spirit and pride by competing to develop a wholly new technology

PROJECT LEAD

The Center for Design and Manufacturing Excellence at The Ohio State University

ALIGNMENT TO STRATEGIC FOCUS AREAS

Deploying educational pathways from high school, through community colleges, to universities

Ensuring more students gain STEM foundational skills

Creating enhancements to engineering curriculum using lightweighting

THE OHIO STATE UNIVERSITY

lift LIGHTWEIGHT INNOVATIONS

For more information, please see lift.technology or www.roboticblacksmithing.com.

For questions about LIFT Education & Workforce initiatives, contact Director Emily DeRocco at ederocco@lift.technology.

For technical questions on the LIFT Prize in Robotic Blacksmithing, please contact Glenn Daehn at daehn.1@osu.edu.

ABOUT THE COMPETITION

Full rules for this competition will be released in mid-September 2016, with the first prize being offered about the end of 2016. Groups may begin forming teams, partnering with industry and planning now.

The competition will be organized in a phased approach with three phases increasing in difficulty:

First Phase

CNC Shaping of Plasticine /Clay

In the first phase, student teams will develop and program a single system to develop three common shapes that will be specified with the competition rules.

Student teams will be evaluated based on the following criteria:

Component quality

Process time

Public documentation of the journey and of approach

Second Phase

Shaping of Soft Metal

Third Phase

CNC Shaping with Thermomechanical Processing

Prizes

$50,000

Winning teams will receive recognition and include total cash awards of at least $50,000.

Rules

Expected to be posted in September 2016