SIP 戦略的イノベーション創造プログラム
Cross-ministerial Strategic Innovation Promotion Program

NEDO

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Innovative Design / Manufacturing Technologies

The Innovations of 3D Printing

About this Project

Creating composite innovation in process, products, and business models with AM (3D printing)

Although 3D printers was seen as magic boxes that could create anything, in reality, their technology levels do not meet the standards of existing machining technologies in terms of conventional technology criteria such as precision and material strength. On the other hand, this technology has features such as being able to make complex shapes that were impossible using existing processing methods, and undertaking simpler per-unit manufacturing, which could not be achieved using existing value standards for 3D printers. In order to allow these qualities lead to innovation, we need to make products that we have never seen before, and use business models we haven never heard of yet to develop them. This project pursues R&D on three objectives: improving to manufacturing technology, establishing product design methods suited for these processes, and developing CAD for data creation.

Improving manufacturing strength
Establishing super engineering plastics processing technology
Equipping the manufacturing industry with new processing technology

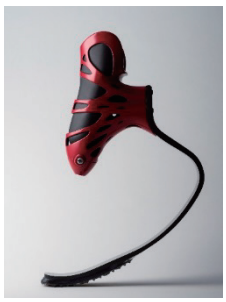
Improving design strength
- A free shape that fits natural objects
- Skilled technicians
- CAD development suited for complex makes, creating high added value

Improving product strength
Exhibition of functional and stylish products

Example:
sports prosthetics

Test Uses / Application Examples

- Rami, AM prosthetic for ground athletics
- miniRami, sports prosthetics for children
- CAD system SFDF for prosthetics
- Standard prosthetics
- High temperature-resistant surgical tool components

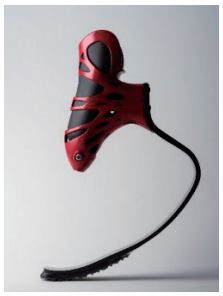


Research Achievements

Realizing R&D on three objectives:

- Improvement in manufacturing technology: successes in the strongest super engineering plastics and PEEK modeling.
- Improvement in product design: developing prosthetic legs for athletics with improved lightness and rigidity over existing prosthetic sockets using AM. Using the full benefits of AM to develop adjustable sports prosthetics.
- Improvement in design aid tools: implementing the skill and know-how of artificial limb makers into CAD. Reducing the work time of artificial limb makers by up to 30%.

Examples of items made with PEEK



Beautiful and functional sports prosthetics

	Veteran	Mid-level	New
Technician work time using existing processing methods	4:05	5:15	7:15
Technician work time after introducing SFDF	1:12	1:30	1:36
Reduction rate	70.6%	71.4%	77.9%

Significantly reduce work time with SFDF

Future Outlook

Creating new added value by fusing three strengths

As a result of improvement in manufacturing technology, we are now able to make products with much better mechanical properties. This can provide prosthetic legs with enormous improvements in their performances. On top of that, we are aiming to switch out the materials of various metal parts, such as in implants and dental restoration and general prosthetics with lightweight and high-performance resins. Thanks to newly developed Super Fit Design System that can separates design and production of products which used to be manually fabricated by craftsmen with special technique, their work time has been dramatically reduced. From here on out, we will continue developing CAD for new products made to fit the body.

東京大学
THE UNIVERSITY OF TOKYO

Research Theme：Manufacturing Initiative through AM Innovation

Members： The University of Tokyo, Tokyo Metropolitan Industrial Technology Research Institute（TIRI）, Aspect, Inc., Elysium Co. Ltd., Manufacturing Science and Technology Center（MSTC）

Contact： Laboratory for Additive Manufacturing Science, Institute of Industrial Science, the University of Tokyo （http://lams.iis.u-tokyo.ac.jp/index.html）