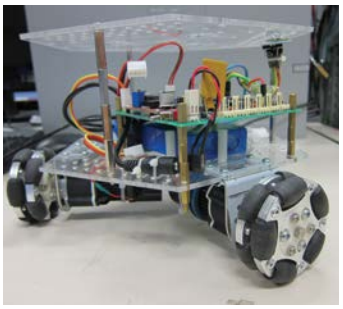
Teacher's Aide

CHINESE UNIVERSITY OF HONG KONG ADDS 3D PRINTING TO CURRICULUM

"The 3D printer is changing traditional methods of engineering, research and development."

– Dr. Allan Mok, Chinese University of Hong Kong's mechanical and automation engineering department

CASE STUDY



The Fortus 3D Production System prints in materials strong enough to sustain prolonged wheel movement.

Developing students' intellectual curiosity is a central principle for educators at the Chinese University of Hong Kong's Mechanical and Automation Engineering department (CUHK): since incorporating 3D printing into their curriculum in 1995, CUHK educators have expanded its impact from demonstrations to building engineering prototypes and creating new devices.

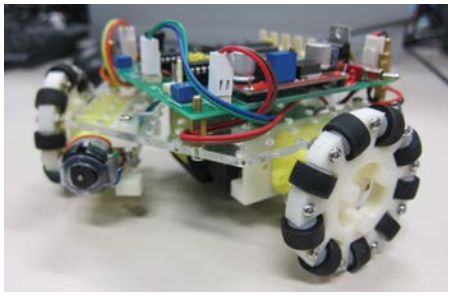
The Department of Mechanical and Automation Engineering at CUHK, formed in 1994, is now on its fourth-generation 3D printer, a Fortus® 3D Production System.

3D Printing Technology in Education

"Our course content is structured to teach design and material-use concepts as well as allowing the students an opportunity to test their own models," said Dr. Allan Mok, electronic officer for the department. With the 3D printer, students can create models easily in only a few hours.

“When we first introduced 3D printing technology into our course content, it was initially to demonstrate casting manufacturing methods,” said Mok. “But now, we routinely use the printer to produce teaching aid tools and offer final-year students a hands-on 3D printing experience, including validating their own model designs.”

With the 3D printer, students can now more easily comprehend complicated mechanics, theories or the integral operation of a component. While the 3D printing system is mainly used for teaching purposes, it’s also used for prototyping, research and development, and business and commercial trials.

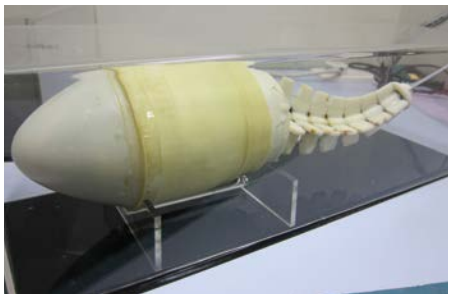


A multi-directional car with wheels 3D printed on a Fortus 3D Production System

Innovative Products

Mok said that the Fortus 3D Production System offers several benefits. “As well as saving us probably half of the startup costs compared to other 3D printers, the thermoplastic material used by FDM® technology enables us to produce ready-to-use components such as an endoscope outer case, the camera bracket on a visualizing device and lab equipment mounts.”

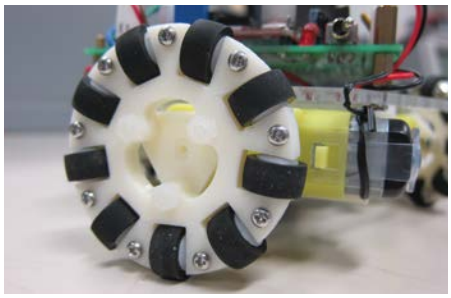
For instance, a PhD student constructed a model car with four wheels facing in opposite directions. “This vehicle is called a multi-directional car because it can automatically move in any direction by employing pre-set computer programming technology,” said Mok. The outer wheels were made from aluminum, but its bearings were 3D printed thermoplastic: strong enough to sustain a given level of wheel movement while embedded into parts made of dissimilar materials.



The fish-shaped model to be used underwater as an assessment instrument.

Beyond Education

The 3D printer also offers benefits outside the educational arena: it facilitates cooperation between faculties and commercial divisions. “Students from the visual arts department will use our 3D printer for prototypes before final decisions on artwork production and we find that commercial students carry out research on our prototypes to investigate marketing potential,” said Mok.



The material’s strength was an important factor in this multi-material prototype.

Allan shows a single-engine aerial device as an example of prototype creativity by students. “We can produce test models that are lightweight and, logically, possess flight capability: such machines are less expensive and faster in production.” He said that both students and the school benefit from the printer, and that they can become more creative to meet more demanding challenges.”

Recently the department created a fish-shaped mechanical model with a strong and durable shell. The model’s internal devices observe underwater activities and take measurements such as water pressure and pollution index, without disturbing the water. Printing and assembling the printed shell was easier and less costly than using an outsourced supplier.

“3D printing is changing traditional methods of engineering and research and development. It’s straightforward to operate and even a non-specialist can use them,” said Mok. “To us, the Fortus system has been, and will continue to play, an essential part in our engineering and mechanical courses; which we hope will eventually get students ready for their future work environments.”

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