

Defence, peace, safety & security

Direct manufacture now turning designers' dreams into reality

The CSIR's technology for special operations (TSO) research area - focusing on developing and applying technology to meet the unique requirements of South African special operations organisations - has recently acquired the capability of direct manufacture, previously referred to as rapid prototyping.

This group, headed by Trevor Kirsten, performs innovation for the defence force through the development of unique products. According to Kirsten, the challenge has always been the time and cost to produce the prototypes and products that can be provided to the customer. "To date, manual and numerical controlled manufacture has been the options available to us," he says. "Direct manufacture technology was now considered mature and cost effective enough for 3D printer be procured as an extension to our capability."

Direct manufacture comprises the stereolithography apparatus (SLA) where a laser sets a layer of wax or photosensitive material in a bath; three-dimensional printing (3DP), which uses injection technology to create a thermo plastic structure; and selective laser sintering (SLS) that uses a laser to fuse powder (nylon, polycarbonate, polymer and metal).

The CSIR has recently procured a 3D printer that uses colour ink jet technology. Kirsten says the printer works like the normal printer that everyone uses to print a photograph, except that it does not print one layer per sheet of paper. "It prints layer after layer using a material that builds up on the previous layer of material," he says, adding, "Each layer is a 'picture' that slices through the object."

The end result, he continues, is a 3D model of the item being printed, and with this machine it is in colour. The model that is the input to the 3DP needs to be created in computer aided design (CAD) software or it can be created by using a 3D scanner, which the TSO group has procured. It is relatively easily transferred to the 3D printer.

"CAD has for many years been able to turn the designer's dream into a computer model that can be viewed on a PC. This has aided the design process significantly but direct manufacture now allows the designer to be able to produce a physical model quickly and

Sample items direct manufactured
(Video camera body, sprinkler, skull
and model of Cape Town)



affordably," he says.

The designer can use direct manufacture to produce the following: scaled model, prototype, low production volume if material properties are acceptable; investment casting (for patterns); injection moulds (for hard tooling); sand moulds (for cores); and soft tooling (for cores).

Kirsten says the CSIR is also working closely with the Central University of Technology (CUT), the University of Stellenbosch and SoSolid in Cape Town. "CUT has shown interest in collaborating with the CSIR in rapid manufacture research and combining our capabilities," he says, adding that CUT has an extensive capability of SLA, 3DP and SLS.

Kirsten invites those who have always wanted to turn their ideas into a physical model or product to contact him. "We want to create a shared direct manufacture capability and service within the CSIR and with partners," he concludes.

- Mzimasi Gcukumana

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