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>
> Jorge Vicente Lopes da Silva, head of the 3D technologies division in Renato Archer’s Information Technology Center

Renato Archer’s Information Technology Center helped create cranial prostheses for a 12-year-old car accident victim. The center designed a skull to adjust to the child’s growth, year after year.

CASE STUDY

Skull Reconstruction

CTI RENATO ARCHER 3D PRINTS PROTOTYPES OF AN ACCIDENT VICTIM’S SKULL.

Innovation and scientific rigor drive Renato Archer researchers’ every step. Renato Archer’s Information Technology Center (CTI) answers to Brazil’s Ministry of Science, Technology and Innovation. Located in Campinas, São Paulo, CTI comprises 12 technological divisions, including the three-dimensional technologies division (DT3D). Its 35 researchers explore 3D technology both onscreen and physically, using 3D printers and other rapid prototyping equipment.

CTI has used Stratasys® 3D Printers since 2005. Today, it has two machines that run on FDM® technology — including a Fortus® 3D Production System — and a Connex™ 3D Printer, which uses PolyJet™ technology. “We were pleased with the results provided by the FDM technology,” says Jorge Vicente Lopes da Silva, head of the DT3D. As the volume of projects grew, CTI wanted new equipment with new features. “We needed highly accurate, multi-material 3D printers; the Fortus adapts well to industrial applications and the Connex is useful in medical applications, in soft structures such as nerves and arteries.”

CTI has developed an array of medical applications using 3D printing technology.

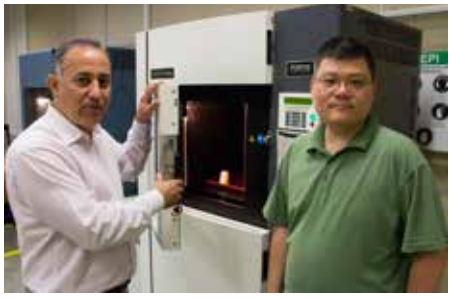
Prototyping a New Skull

One such medical application was to help a 12-year-old boy who lost part of his cranium in an accident and needed reconstructive surgery on his head. “The great challenge of this case was to design a new skull that could adjust to the child’s growth, year after year,” says DT3D researcher Peter Yoshito Noritomi. This requirement made this medical case even more critical. “If we used a conventional prosthesis in this cranioplasty, the device could be rejected because of the growth of the patient’s head; another risk would be the deformation of the skull.”

The DT3D team used FDM technology to 3D print the prototypes, which allowed it to work with very durable materials. “Those materials helped us to create models that, later, would be copied, helping with the creation of the actual prosthesis, in bio-compatible material,” explains Noritomi.

Jorge Vicente Lopes da Silva and Peter Yoshito Noritomi of Renato Archer used both FDM and PolyJet 3D printers to develop medical applications.

Cases that demand surgery planning, on the other hand, usually are based on other models and developed with the Connex 3D Printer, which DT3D acquired through an agreement with the Ministry of Health. “This machine is particularly suited for high-accuracy applications. This printer can generate layers of two hundredths of a millimeter,” says Noritomi. The Connex 3D Printer is ideal for medical applications that require prototypes of soft anatomical structures such as arteries and nerves. “Depending on the material used, we can print more flexible objects.”



Renato Archer used its Fortus 3D Production System for its durable materials.

An essential component of CTI’s medical applications is the InVesalius software, developed in the institute’s laboratories. InVesalius can be downloaded for free at www.cti.gov.br/invesalius. It is an open-source platform for reconstruction, in 3D format, of 2D images generated in studies made with computed tomography or magnetic resonance equipment. The center of a global community of researchers and users, and fully developed as an open platform, InVesalius has been translated into 10 languages and is used in 100 countries by 10,000 people.

Supporting Hospitals

Silva said CTI regularly collaborates with other organizations, including hospitals and businesses. “We have participated in more than 5,000 projects for rapid prototyping and manufacturing for the industry” says Silva. Many fall under CTI’s ProInd and ProExp program, which aims to develop new solutions for cutting-edge companies, especially in the area of oil and gas and in the aerospace industry.

Connex technology helps Renato Archer develop medical prototypes that require flexibility with its range of rubber-like materials.

ProMed, another DT3D program, takes 3D technology to the medical arena. “We have already worked on more than 3,000 cases, developing prototypes in 3D that are essential for increasing the accuracy of surgical planning and the success of interventions while reducing the cost of treatment,” says Silva. The program supported 180 hospitals in 2012 and 2013 alone, throughout Brazil and in neighboring countries.

Businesses small and large tap CTI and its 3D printers to validate their products and generate functional prototypes. For example, professionals from Petrobras and DT3D work side by side in petroleum exploration projects. “The Petrobras team knows a lot about wells, while we have mastery of 3D technologies; the sum of these talents increases the competitiveness of our industry,” says Silva.

Renato Archer’s Information Technology Center also serves hundreds of area hospitals with its 3D printing capabilities.

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