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the **AAM**  
ACADEMY



**Low Cost Medical Devices**

## **The Editors Desk**

**Dear Readers,**

It has been a great pleasure in publishing this magazine. My aim of the publications is to give you insight and views into the amazing world of Additive Manufacturing, Artificial Intelligence, Augmented Reality and Coding.

I would like you to explore all the topics discussed in depth. I hope you like my publication and my style of approaching the topics.

I am open to your views and would love your suggestions and comments.

Thank you for your support.

Regards

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# Low Cost Medical Devices

The Open Source Community has transformed the medical industry for an exciting journey. Medical industry is the most demanding and time consuming in terms of development and introduction of new products, due to the amount of care and precision required. It is a high risk industry as any mistake can lead to death of patient(s) or permanent damage to their vital organs.

Though additive manufacturing has helped in researching cell growth and quicker generation of replacement organs and tissues in-lab. There is a huge glimmer of hope for various non-invasive and safe treatment devices like prosthetics, dental, hearing-aid and cranium support or help to children with skull deformation during their early stages of development.

Let's learn a few technologies that has transformed the industry -

[Additive manufacturing](#) or 3D Printing as we all know, starts by depositing melted plastic on a surface using a computer controlled pattern over many layers eventually forming a solid part. Using this technique quick production of useable devices are possible.

[3D Scanning](#) involves scanning an object using a method where many photographs are taken at varied angles and then combined in a virtual space to form a structure or object. This process is known as photometry. The 3D Scanned data can be used in any computer aided design software to make the pattern which 3D Printing can use.

[CBCT or CT Scanning](#) - Cone Beam Computer Topography is another technique of scanning internal organs. It involves a rotating radio-active emitter that directs particles in a narrow beam there particles are of different strengths and a computer sensor that measures emitted particles. Both the emitted and sensor are placed on a rotating tunnel. When the patient is placed inside the tunnel, these particles either get absorbed or they pass through the various organs. Measuring their strength at many angles, creates a computer image made up of millions of tiny dots of varied colours. Bones are very dense so particles hardly penetrate through bones creating white dots. Water / Air spaces in our body is least dense particles can easily travel through them without much absorption so they are mostly black in colour. Using a computer software these dots and their colours can be mapped to form shape of vital organs inside our bodies with accuracy less than 1 microns. This technology is widely available in all hospitals today and medical professionals have been relying on their data which previously used to be 2-dimensions like an x-ray. But now with 3D technology, doctors can not only see the data by also create a model which helps them in pre-surgery planning, creating patient specific devices for operations / post operation supports and education.



# Cranioplasty, Cranial Implant and Re-construction Surgery

Crania is the structure of bones that encase the brain. When we touch our head, underneath our hairs and skin is a structure of five pieces of bones merged together during our early childhood development.

The Crania can get damaged due to accidents involving severe head injury. It has to be completely removed during operation procedure for brain-cancer or brain surgery. Sometimes crania has to be removed due to swelling in brain which causes pressure buildup inside the crania.

The only way to fix the crania is screwing an artificially created plastic sheet, ceramic or titanium structure to match the shape of the head and allowing tissues to grow finally covering the head with hair to hide the crania.

To perform this delicate procedures surgeons would spend hours inside the operating room, multi-tasking as a carpenter and metal worker to give these sheets / strips of plastic the shape of their patients head and screwing it in place.

Today, we can simply take a CT Scan giving a clear picture of the shape of the head. Computer Softwares are used to map the shape and create the missing part. Then we manufacture the same part using 3D Printing Techniques with same materials used in the past. Now the perfect piece has to be simply placed after operation and screwed in place by the surgeon. This process saved many hours in the operating room which is taxing for the doctors and dangerous for the patient.

