

Topic:
Industry
Interviews

Interview with Andrew Hally of SensAble Technologies

In the world according to [SensAble Technologies](#), people interact with their computers via the sense of touch. We caught up with Andrew Hally, Director of Marketing, to quiz him about their FreeForm modelling system.

iCAD asked:

- What market is FreeForm aimed at? So what does 'modelling with touch' actually involve?
- How long does it take to master FreeForm?
- How does FreeForm relate to the CAD world?
- Do you see FreeForm stepping into the CAD world in future?
- Where is SenseAble heading with this kind of technology?

SensAble Technologies' solutions allow computer users to "touch" 3D data. This interview focuses on the **FreeForm™ modeling system** that allows designers to model on the computer as easily as they would with clay or foam. FreeForm tools use familiar metaphors, such as sculpting and wire cutting, which work in a direct and obvious manner. The peripheral device provides force-feedback as the user comes in contact with the "digital clay" seen on screen. [SensAble Technologies](#) has over 500 customers in 30 countries including Adidas-Salomon, Hasbro, Boeing, Shell and Motorola.

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What market is FreeForm aimed at?

SensAble Technologies has been around for a while, selling software and hardware that lets people use touch to design things on the computer. This covers high-end applications such as surgical simulation and assembly path planning.

However, FreeForm is our first end-user application. We looked into the needs of a particular group of companies who approached us with their modelling problems - and it seemed to present a really good opportunity. Out there was a set of customers who were not well served by the previous generation of modelling solutions.

Toy makers are a great example. The shapes they make often have a very organic or detailed nature. These features have been really difficult to capture with the surface or solids mathematics that underlie the traditional tools. The catalyst to get us working on a solution to this problem came when companies like Mattel and Hasbro came to us saying, 'We've got dozens of people doing this in clay and wax the same way people did it decades ago.' So that's where our initial focus with FreeForm is - shapes that are very difficult to do in CAD/CAM.

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We started off in toys and we've quickly found that there are a number of other similar markets. The second biggest for us would be footwear. We have seven or eight footwear customers in the US, including Adidas, plus others in Europe. Other companies are using FreeForm to model ceramics or crystal.

So what does 'modelling with touch' actually involve?

It's hard to describe, because there are so few English words relating to touch. People have never used touch on the computer before, and they really have no idea how it works until they try it.

The key is that as the user is moving the modelling tool, they are feeling the model at the same time. They have a very interactive sense of working with that model.

So being able to model with touch enables you to do lots of things you previously couldn't. For example, when you're using traditional packages to model with solids or surfaces, in a way, you're setting up a procedure - you're telling the computer what you'd like it to model for you, e.g. blend surface A into surface B. The computer then goes off and does it.



With surface and CAD modellers, to some degree you need to know where you're going to end up before you even start, because you have to set up a series of actions and get those two surfaces laid out correctly in order to blend them properly.

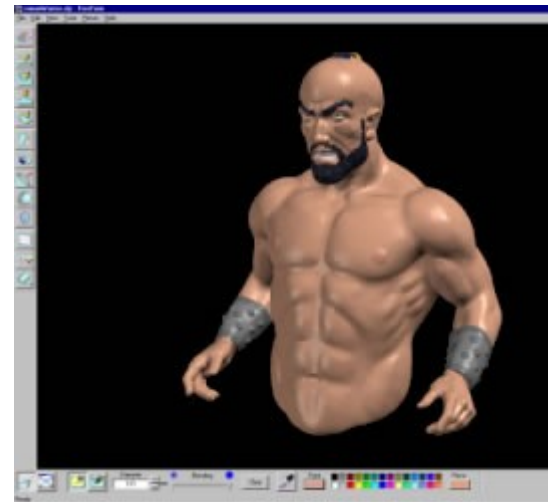
That works for some things, but not for others that are more character-like or organic -think, for example, of a surface with thousands of wrinkles. A much better paradigm that we can create is to enable people to work on the computer just as they do in clay. They simply sculpt the model out of digital clay - and that is completely non-procedural. If you don't have to worry about setting things up, it makes modelling a lot easier.

Our model representation is not based on surfaces or solids; we use a 'voxel' model representation. A voxel is a volumetric element, the same way that a pixel stands for a picture element. It's like a 3D pixel. So to make a wrinkle, or blend in a piece of ceramic, you simply take a sculpting tool and smooth it down as you wish. You're not having to say, 'that's a surface, how would I manipulate a surface and change the weightings of the u and the v?', or 'how would I do a Boolean operation to get that kind of a blend?'

The fact these volumetric elements have no procedure about them means you can simply interact with them in the same way that you interact with a lump of clay in your hand.

The nice thing about FreeForm is that not only can you feel the thing that you are working on, but you're moving in 3D. You're completely unencumbered; you're not in flat land anymore, and if a feature you're trying to carve goes from the front all the way around to the back, you just carve it that way.

You never have to stop and change the view; nor do you need to have all that user interface involved in changing views or working in the 'z' dimension.



FreeForm model
courtesy of Roman Kashalapov

How long does it take to master FreeForm?

The beauty is that there is a near-zero learning curve for users, even though some of them have never even used a computer before. They simply apply all of the hands-on model-making skills they have, except that they're on the computer. They've got the benefit of things that are as prosaic as 'undo' or 'error'. You can speed up such simple things by a factor of 2 or 3, because it's the very same paradigm that they've been using for years.

How does FreeForm relate to the CAD world?

FreeForm was developed for the sort of functions for which CAD has not been used. However it turned out that a lot of our customers in the toy industry do use 3D CAD tools. In some cases a toy company will have very blocky and regular shaped products that can be done in 3D CAD. But also, a lot of toys have complex internals, e.g. gears, electrics, circuit boards, batteries and so on. They are using 3D CAD a lot for this type of work. However, doing the exteriors of some of these products with clay and wax became a painful process for them. It was really difficult to make the internal and external designs work well together.

The only place that they would come together was in Asia, at the tooling site. There they would literally make tool steel for the exterior by copying a clay model in a process called 'panograph', which is like a 3D key copying machine. But then they'd use the modern method of 3D CAD?driving CNC to do the inside of the mould, the mechanical part. So they had this really broken process.

But it was unavoidable because they could not sacrifice the look of the end product.... If Barbie doesn't look like Barbie, they're finished!

FreeForm overcomes this problem. For products with CAD internals, you can import into FreeForm what the industry calls a 'buck', a defined space around which model makers know they have to sculpt their clay. The other thing is that you can then export from our model just by surfaces, and those can go into the CAD system. So you see, you can now make a toy completely using a CAD system, because you can sculpt that exterior digitally using FreeForm and bring it into the CAD system as IGES surfaces. It's really helping this part of the industry shift into the digital age, rather than dwell in the awkward, half digital/half physical stage.

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Do you see FreeForm stepping into the CAD world in future?

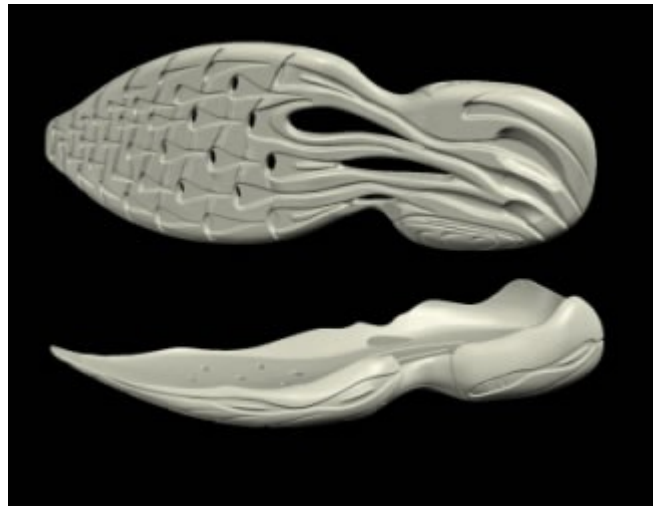
I would say that with FreeForm we draw a bit of a line between what we do and what CAD does, and I don't think we're going to be crossing over that line. We are not ever going to try to do things such as the mechanical internals of a product. CAD does that brilliantly. PTC, SolidWorks, Dassault and so on, all work great for internal engineering. There's not a lot of room for us to add value there. It's in the exterior design where we can add some value. So I don't think you'll ever see us cross over that line into mechanical engineering.

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Where is SenseAble heading with this kind of technology?

There are a lot of things that we could do. Modelling was one of four or five end user applications that leveraged our touch technology. We could have focused on other totally different applications like surgical simulation, assembly path planning, and maintenance path planning.

As far as FreeForm's modelling future is concerned, right now we've found a lot of industries that have been left behind by CAD. Thinking beyond toys and footwear, these include ceramics, confectionery, jewellery, furniture and collectables. So this customer group will remain our first priority, not least because at the moment there's no competition.



FreeForm model courtesy of Steven Hsiao, RAT Taiwan

We were really surprised how many people were making products that were not well suited to traditional CAD and CAE software.

We've got other customers making less organic models who use FreeForm in more of a conceptual modelling way. For traditional consumer electronics products, CAD or CAE software is usually introduced late in the process. Sketching and then modelling in clay or foam is really used to get their initial concept down, because they can make those foam models in just a couple of hours. It's very difficult, however, to make a computer model in anything less than a couple of days, which is simply not fast enough for the highly iterative process of industrial design. So I think there's value to be added within industrial design at some point in the future

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Many thanks to Andrew Hally for talking to iCAD.

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