# INSTANT INSIGHTS WITH 3-D PATIENT AVATARS

IBM research is about to put their visualization software ASME to the test in a Danish hospital. Using a 3-D representation of a human body, ASME makes patient medical data accessible at one glance. If the test phase goes as planned, the software will be brought to market in a few years.

Naked and bald, with the silhouette of a man or woman, the patient avatar presents itself to the ASME user. With a mouse click, an orthopedic surgeon can turn the virtual patient around, zoom into the spine, remove any muscles and ligaments that obstruct the view, select a particular vertebra, and change the angle from which he is looking at it. On the side, all relevant patient medical data will appear: for example reports, notes, lab results, x-rays, and MRIs. The surgeon can open any of these files or further narrow the research results according to parameters like time, certain diseases or procedures.

ASME, short for "Anatomic and Symbolic Mapper Engine" and a play of words on "like me", functions like a browser in the sense that it performs a search over a multitude of databases and lists them in a meaningful way. Similarly, a surgeon can select and highlight any area of the body. He or she can also identify why some parts of the body are highlighted. For example, the lower back may be highlighted because this patient has a L5/S1 protrusion. Conversely, the surgeon can feed new patient medical data into the system, and the data will automatically be assigned to the relevant part of the virtual patient's body. The days of surgeons laboriously working through piles of documents before their patient rounds seem numbered.

However, ASME is not only an asset for doctors, but also for nurses, patients or even whole organizations like hospitals and health insurers. For hospitals, ASME can be used in several places in the patient flow. It can be used for triage, during consultation, and for debriefing with or without patients.

ASME is not so much a tool for sharing or exchanging data among institutions as for representing it. Hence, the software does not collect information from outside sources, but complements the existing national infrastructure for this purpose.

Basically, ASME works like a set of plug-ins. Doctors and organizations select a set of services, which are then customized to their needs. ASME for orthopedic surgery, for example, will be more detailed in the representation of bones, nerves and muscles.

In the following six months, intensive tests will be done with orthopedic clinicians in Denmark who will help design the interaction and find out how the system is actually used by clinicians compared to the existing electronic medical record (EMR).

André Elisseeff, PhD

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## INTERVIEW WITH IBM RESEARCHER ANDRE ELISSEEFF

**What have been the main challenges of the project?**

To make using a 3-D or 2-D model intuitive. When a user clicks on a body part, he or she should get the information that relates to the part he just clicked on. You have two challenges there: first, what part was really clicked on – the body is rather compact and sometimes a user clicks on a bone although he or she is interested in the whole region, or vice-versa. Finding what is meant when the user clicks is one of the most exciting challenges in developing the tool. Second, you need to define what is relevant out of a vast and heterogeneous amount of data, which can include images, lab tests, medical notes, etc. This is particularly tricky when you know that medical concepts can have several synonyms. The use of a controlled vocabulary like SNOMED, the Systemized Nomenclature of Medicine, helps a lot by providing the list of alternative names for many medical terms.

**Which human body data and graphics program were used for the avatar that ASME uses now?**

We used the 3-D anatomy model of Primal Pictures. The body data stems from the National Library of Human's Visible Human Project, which involved the acquisition of transverse CT, MR, and cryosection images of representative male and female cadavers.

**Are there any competing applications? What is special about ASME?**

With the few competing applications that exist, data has to be tagged manually to areas of the patient avatar. That means that there is no easy way to process existing data: either an expert links all electronic data to the 3-D model manually or this data is just ignored. ASME, on the other hand, does this automatically. That means it can process existing data. It can also be run directly on a web page and one can imagine using ASME as a patient to browse medical pages over the internet and having an automatic summary on the body of the anatomical parts that are mentioned in the page. We do not have any direct competitors, though. There are a few applications designed by universities or start-ups, but they serve very specific purposes. ASME is actually focused on automatically binding textual and unstructured data into a graphical representation of the human body. So we feel more complementary to these applications than really in competition.

**How is the patient's privacy protected?**

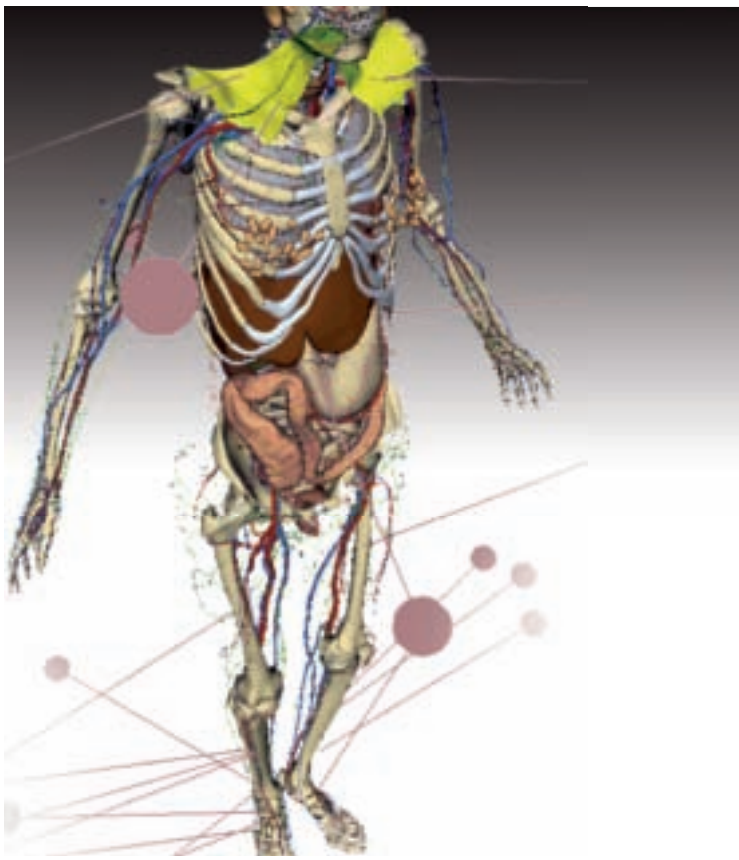
Privacy and access rights are managed directly by the data sources, for example the hospital. ASME relies on the existing systems and does not add any other information than what can be accessed.

**In short, what is the main advantage of ASME?**

Speed. Before rounds, the doctor does not have to look at patient files. It's also a nice support for discussions. Doctors can look at the screen together, the problem is highlighted, they do not have to study the files one by one. Patients and doctors can also discuss together in front of the screen.

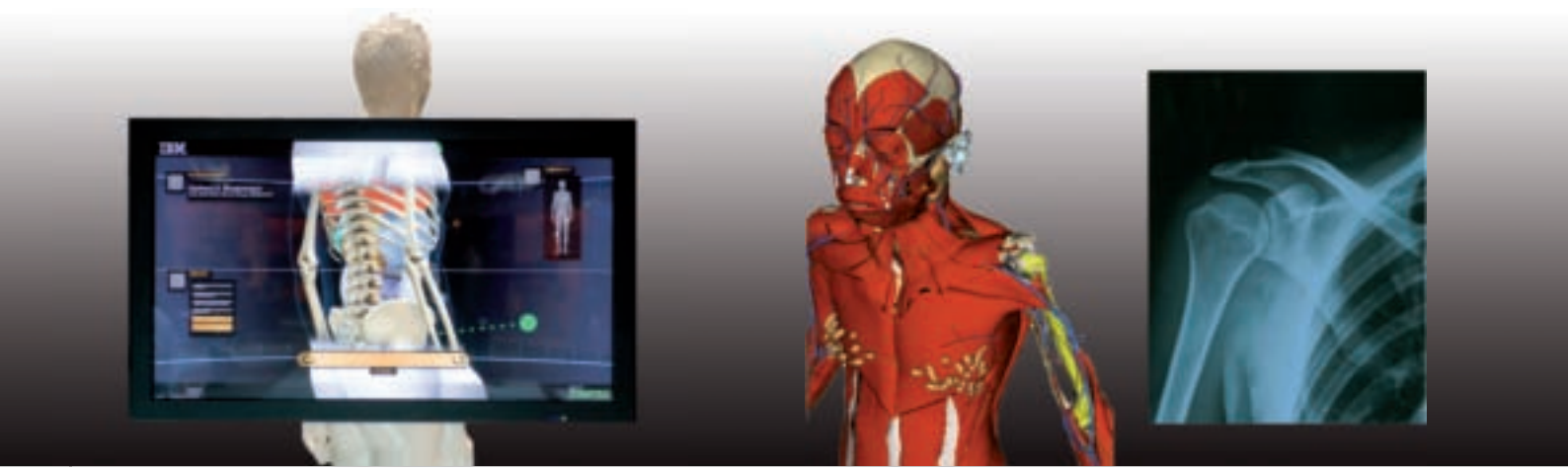
**How much will ASME cost?**

We haven't defined the price, but it's not going to be overly expensive compared to the price of the existing EMR. Of course, the price will depend on the services the customer chooses. There will also be different prices for different organizations.



**What are your ambitions for ASME?**

It would be nice to design a 3-D model based on each patient's real body, that is an avatar with the same size, shape, location of the organs, vessels, bones etc. as the patient. In a few years, it's very likely that manufacturers will provide devices to scan a whole person. ASME would then make it possible to automatically map the medical records directly onto the 3-D model of the actual patient.



## HOW PATIENTS BENEFIT

When a patient visits a doctor's office today and complains of back pain, the doctor will ask the patient about any history the patient can recall, do tests, and visually and physically examine the patient. After that, the doctor will usually sort through stacks of paper records but will most likely not have access to the full patient history and similar complaints.

The ASME 3-D avatar will allow doctors to click on the 3-D avatar of the human body—here the spine—and instantly see all the available medical history and information related to that patient's spine, including text entries, lab results and medical images such as x-rays or MRIs. Or the doctor might be interested only in information related to a particular part of the heart; in this case, the practitioner can zoom in, narrowing the search parameters by time or other factors.

Using advanced machine learning and state-of-the-art 3-D modeling techniques, the IBM researchers are working to overcome key technical challenges including integrating heterogeneous data sources and complex text-based information—so-called unstructured data—and linking that data to the anatomical model in a meaningful and easy-to-navigate way. ASME also uses SNOMED, the systemized nomenclature of medicine that encompasses approximately 300,000 medical terms, to create a bridge between graphical concepts and text documents.

## NEW PRODUCTS

### Painless epidermal drug delivery

Receiving medications without a needle would bring a sigh of relief to many, particularly people who receive regular injections, such as diabetics and those controlling pain. Pantec Biosolutions AG in Liechtenstein has a solution: the needle-free P.L.E.A.S.E.® (Painless Laser Epidermal System). The handheld laser-based, transdermal (under skin) drug delivery device uses very short laser pulses to create aqueous micro pores in the layer of skin above the nerves and blood vessels, without thermal skin damage. Patients can use with device with no supervision and the number and depth of the pores can be custom tuned. It is said to be suitable for both low and high molecular weight drugs.

*www.pantec-biosolutions.com*

### Entertainment, education, and information

Avoid a cluttered bedside environment with MEDIVistaTM, a point of care patient management system that integrates bedside entertainment services with electronic patient records. Developed and patented by Lincor Solutions, a Dublin, Ireland based firm, the company claims the system can deliver: TV, radio, telephone, internet, video-on-demand, audio books, patient education, dietary management, and surveys all through the touch-screen terminals. The system securely uses the local intranet and can be integrated with hospital information systems—discuss an upcoming operation with a bedridden patient while viewing their x-rays together. Features flexible billing and reporting components.

*www.lincor.com*