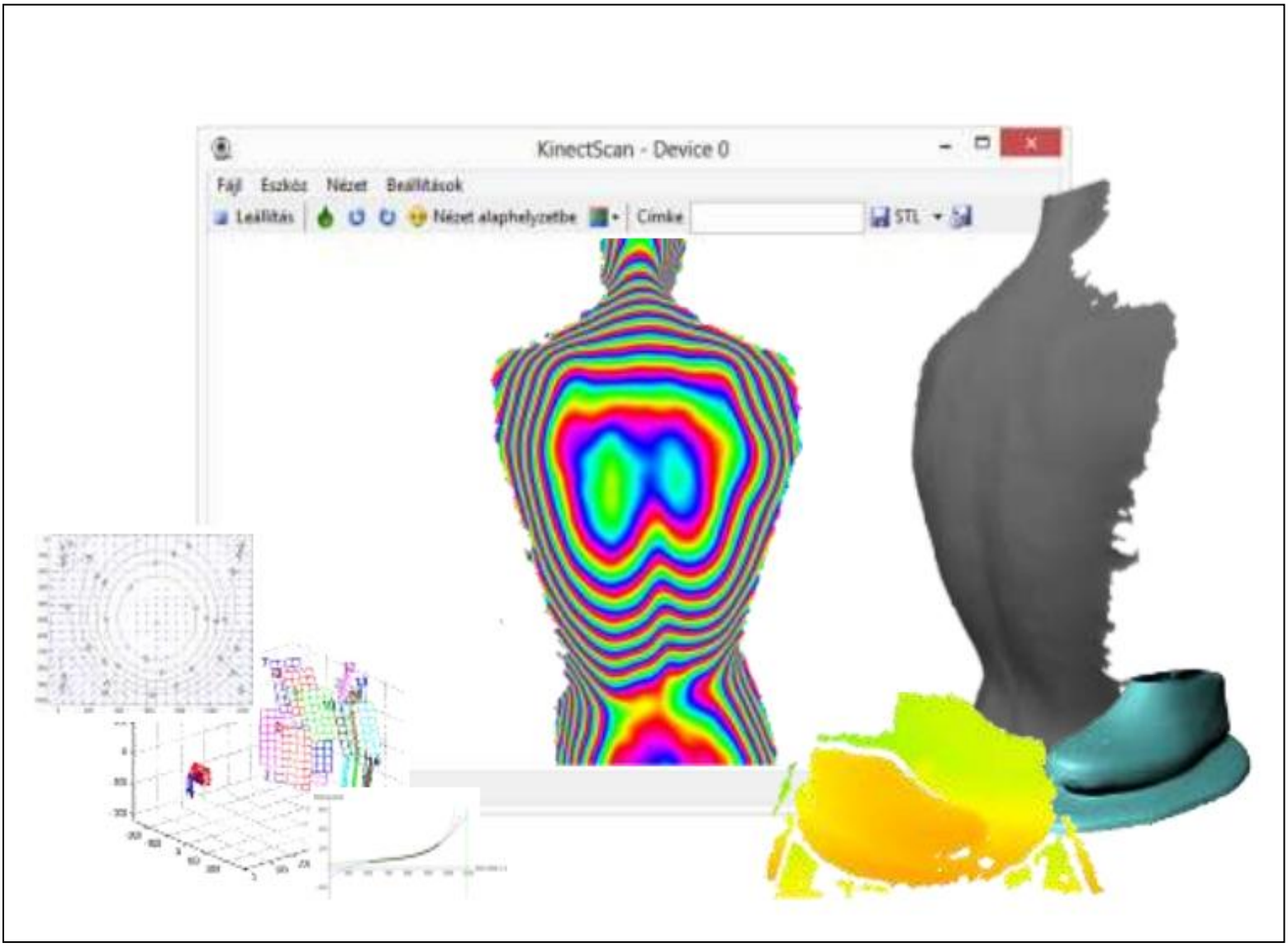
Zoltán Kalla

Short Description of Optical Depth Sensors For Medical Use.



Short presentation of the development.

To understand the details of the development we have to look for some other points not directly related to medical diagnoses., because the development's different parts are build on each other.

At the beginning of the development the basic goal was to create a CAD software, which can be used in the clothing industry for making measurements, to create clothing tailored to size. Because in 2001 there were no 3D body scanners, the main goal was to create a device to make a 3D model , as you can see on image 1.

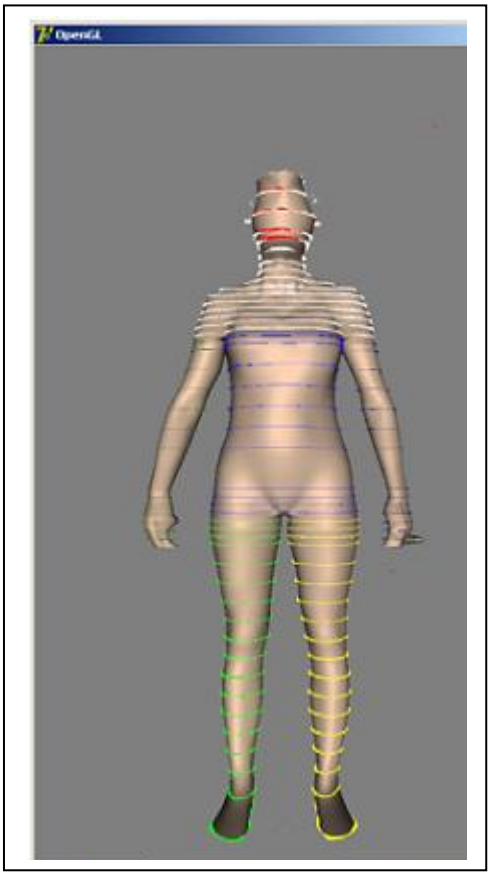


Image 1.

But at the same time saw that the device is to expensive and big for the shops to use them there. So we had to move to on other interesting technology based on 2D pictures. It was a hard way, but we understood how to create a new method, how to make a 3D model based on two 2D pictures, and to size it correctly. Shown on image 2.

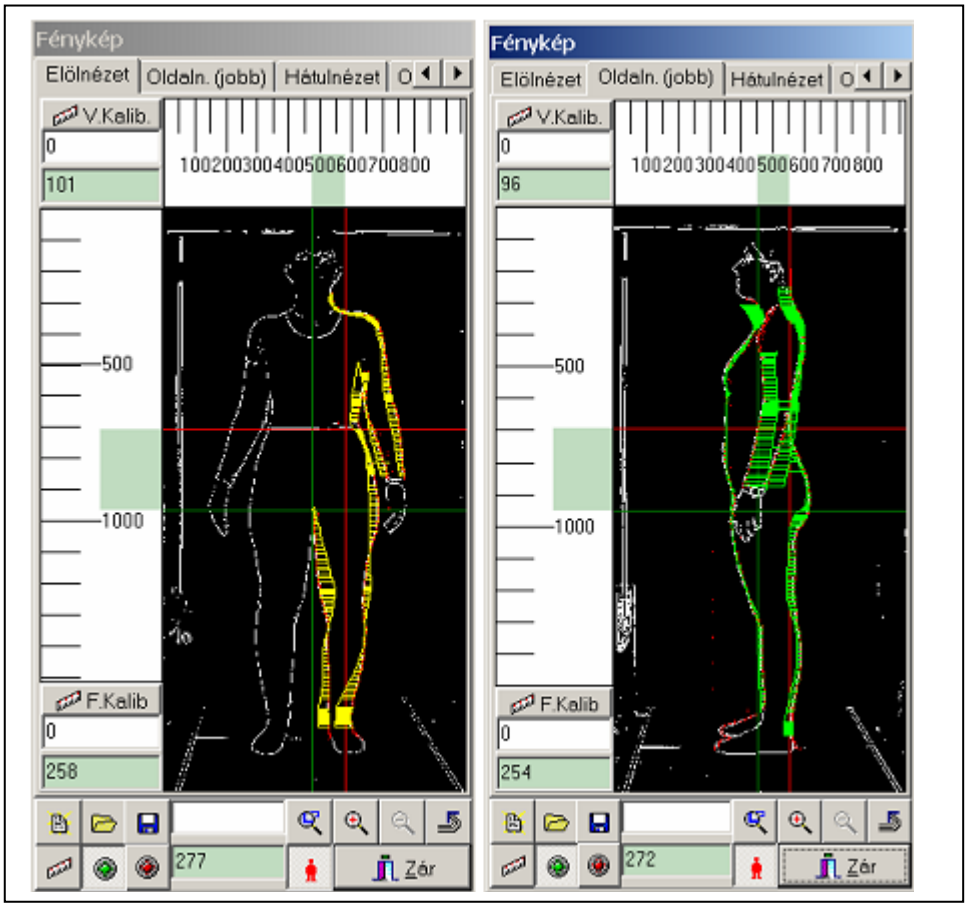


Image 2.

By this we have achieved the target of our project. Now the next step was to find the right algorithm, which can help to mapping the body, and to create the clothes correctly and precize for the 3D. So we made a 2D planar projection of a clothing for a 3D figure. But by this step we had to examine the human body a little bit more. So by this examination we had to recognize that the posture of each human being is unique, but at this point we saw that there are symetries, typical for healthy people. And here we had realized what we found for. At this pont we saw the possibilities for the diagnoses in the medicine. Because we already finished the CAD part of our original project, we had the chance to create something no one did before in the past for the medicine. So because we already had all information needed in our original software , it we had to find a perfect body scanner as you can see on image 3.

Image 3.

We made a lot of measurments and scans and we also made it to resize the device for a smaller one. We also thought we should make the development of the software ponting out, that it has to hold all the data inside a database for further use. As you can see on image 4. and 5.

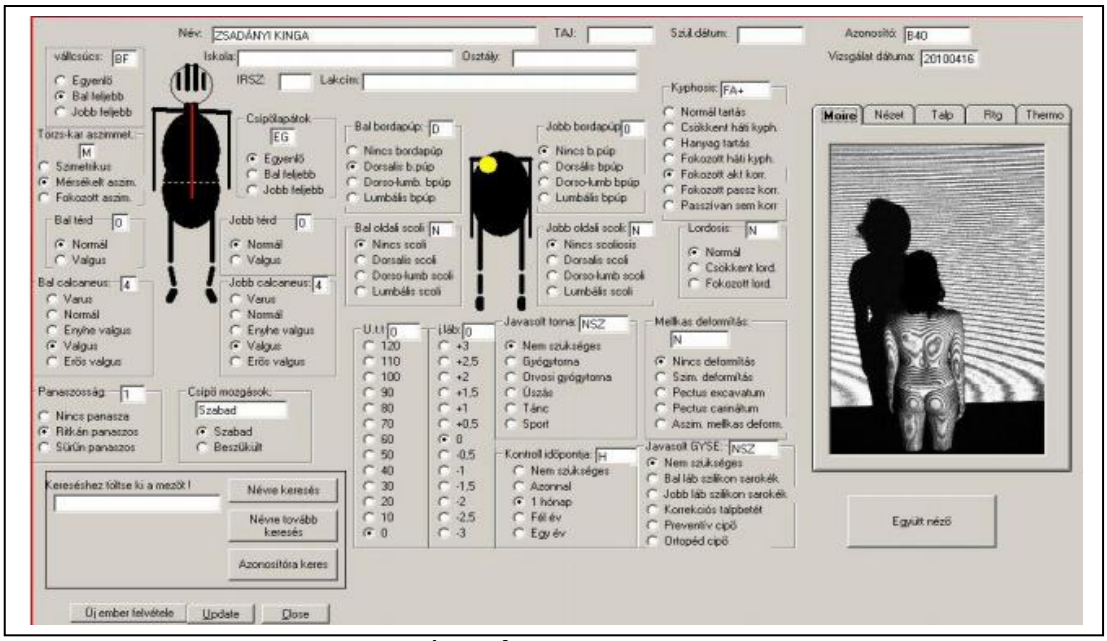


Image 4.

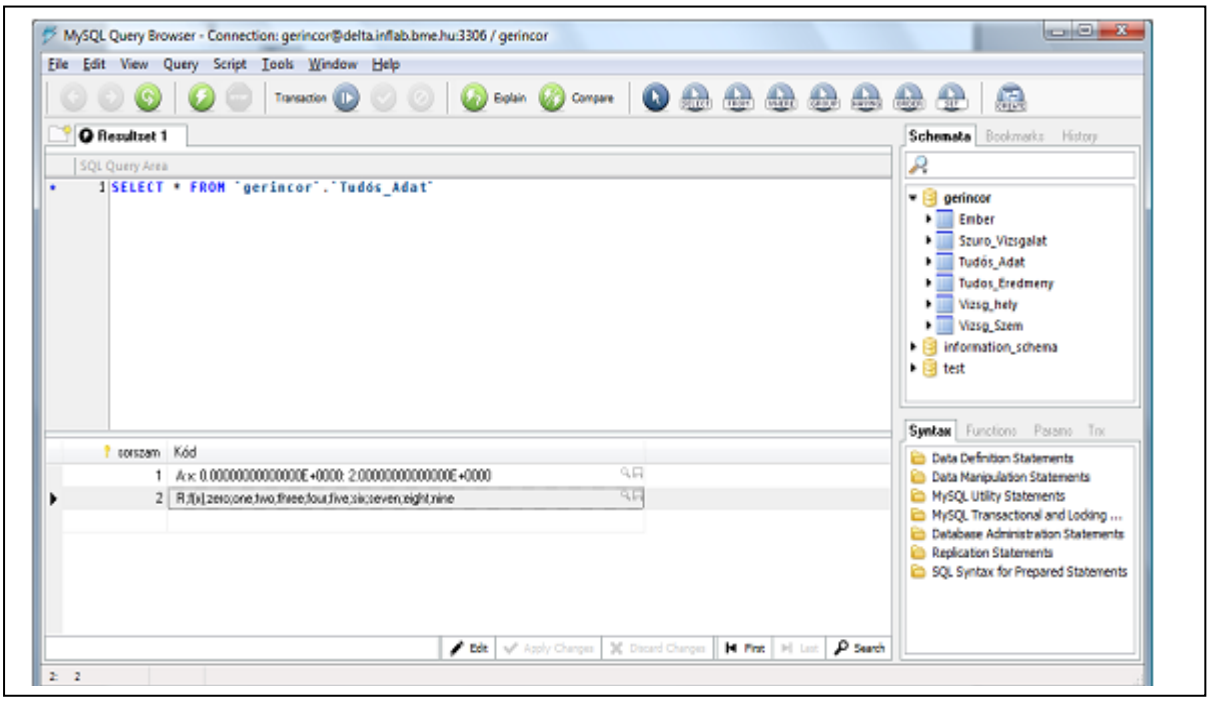


Image 5.

With the help of the software's database, and the already included pictures and informations are helpful in further diagnoses, to have comparing background for usage and information gathering. The more patients are registered in the database, the more solutions can be given for cures and therapies. The software can learn from itself and gives a much more precise diagnosis every time. Shown on image 6 and 7.

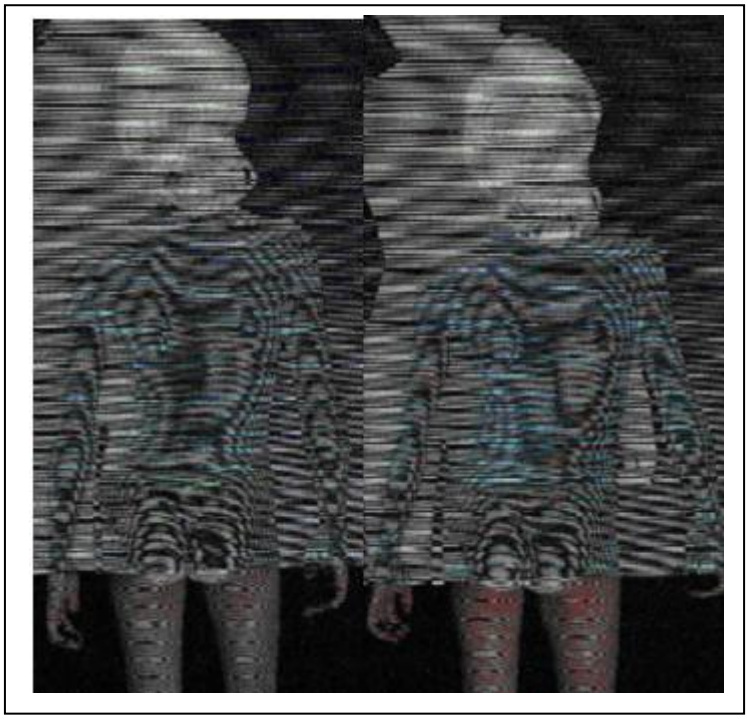


Image 6.

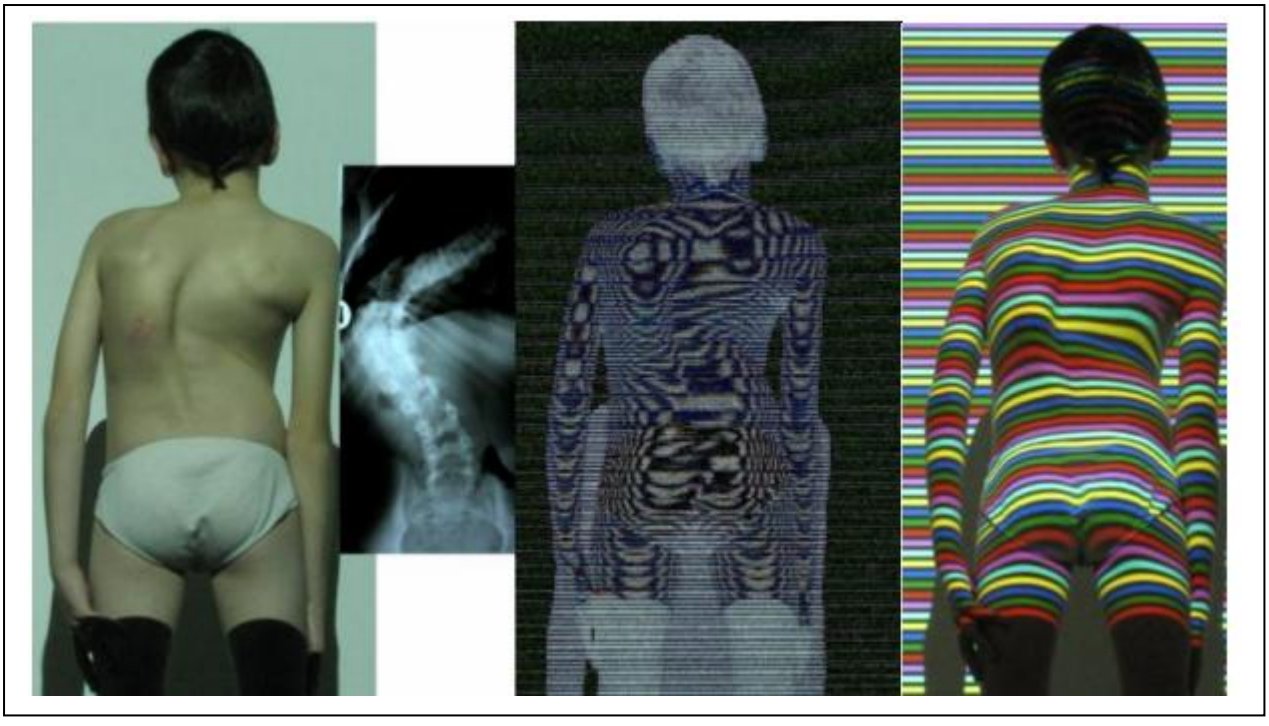


Image 7.

For a more precise picture, we made the thermographic records, and we included them into the database as you can see on image 8.

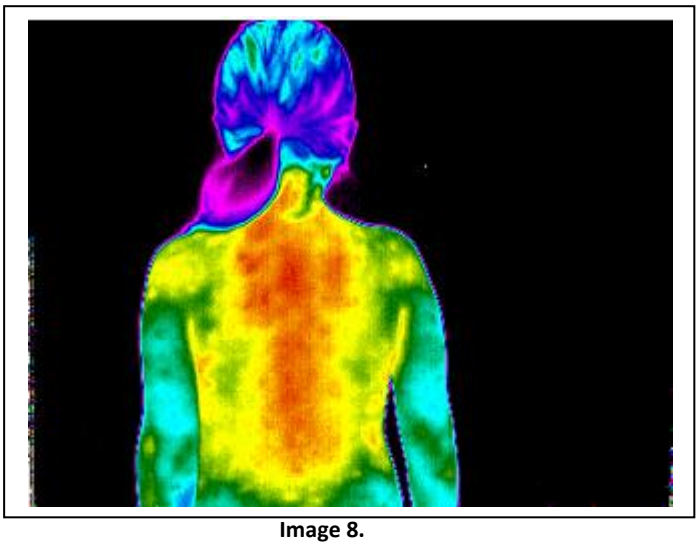


Image 8.

The database with all previous patients is made for a simple usage, and it is possible to look at all saved data. As image 9 shows.

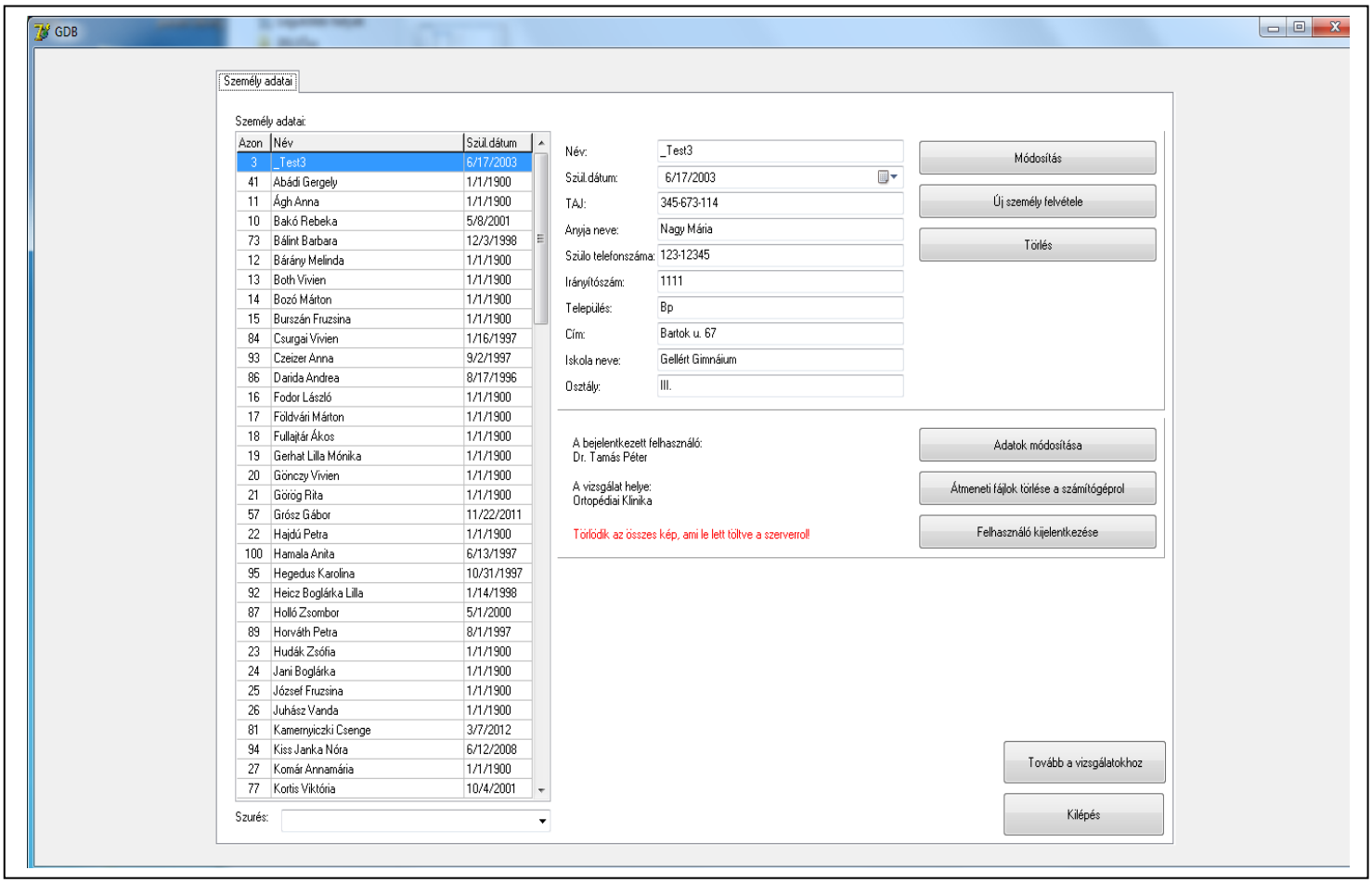


Image 9.

The database also helpful for the patients, because it is possible to look for any data previously added. It is easy to look through the recovery period of each person in the database. Image 10.

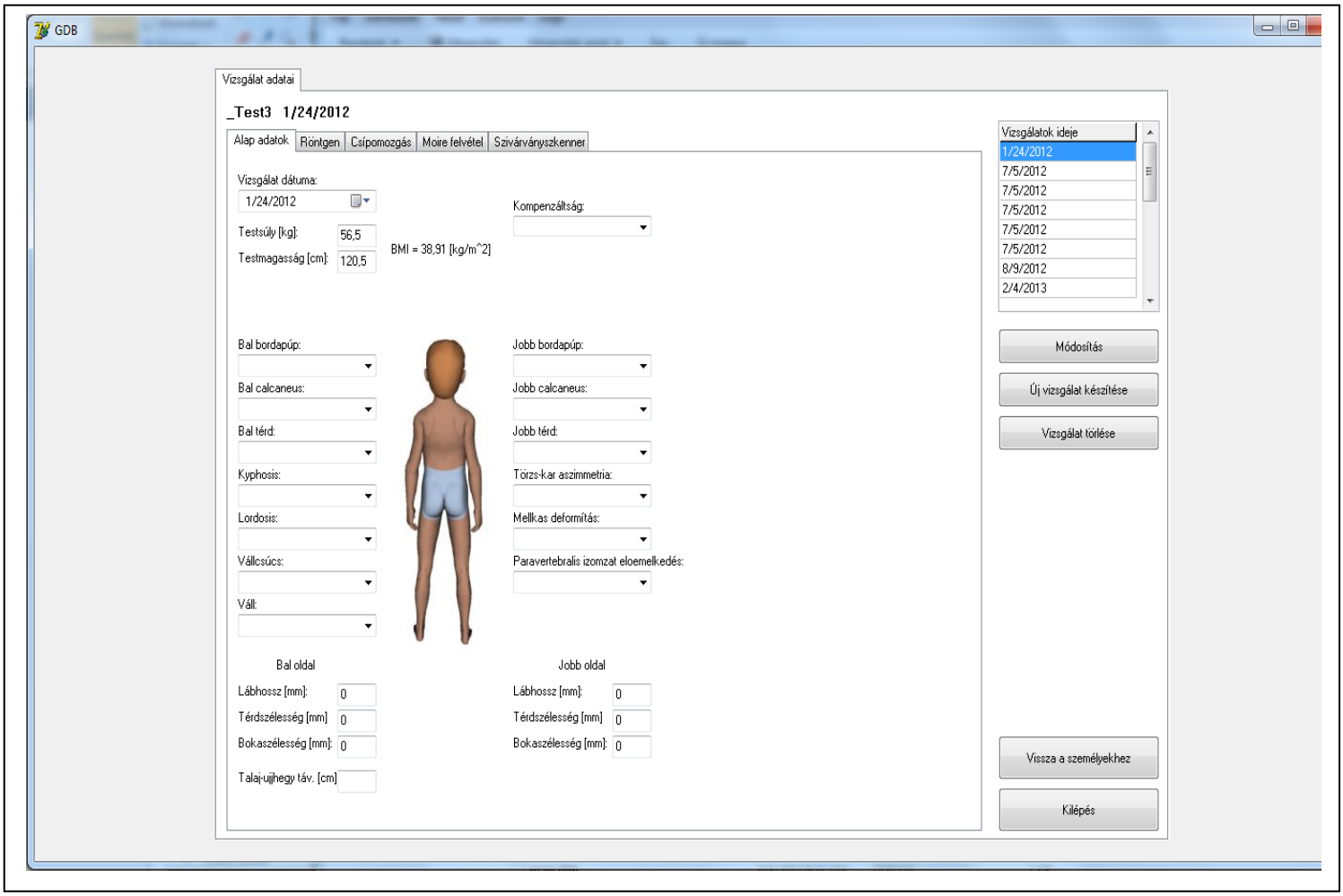


Image 10.

After the database starts the controll. We can use the images, pictures for measurments like on the right. On the left you can see, the how the software messes the symmetries. Image 11.

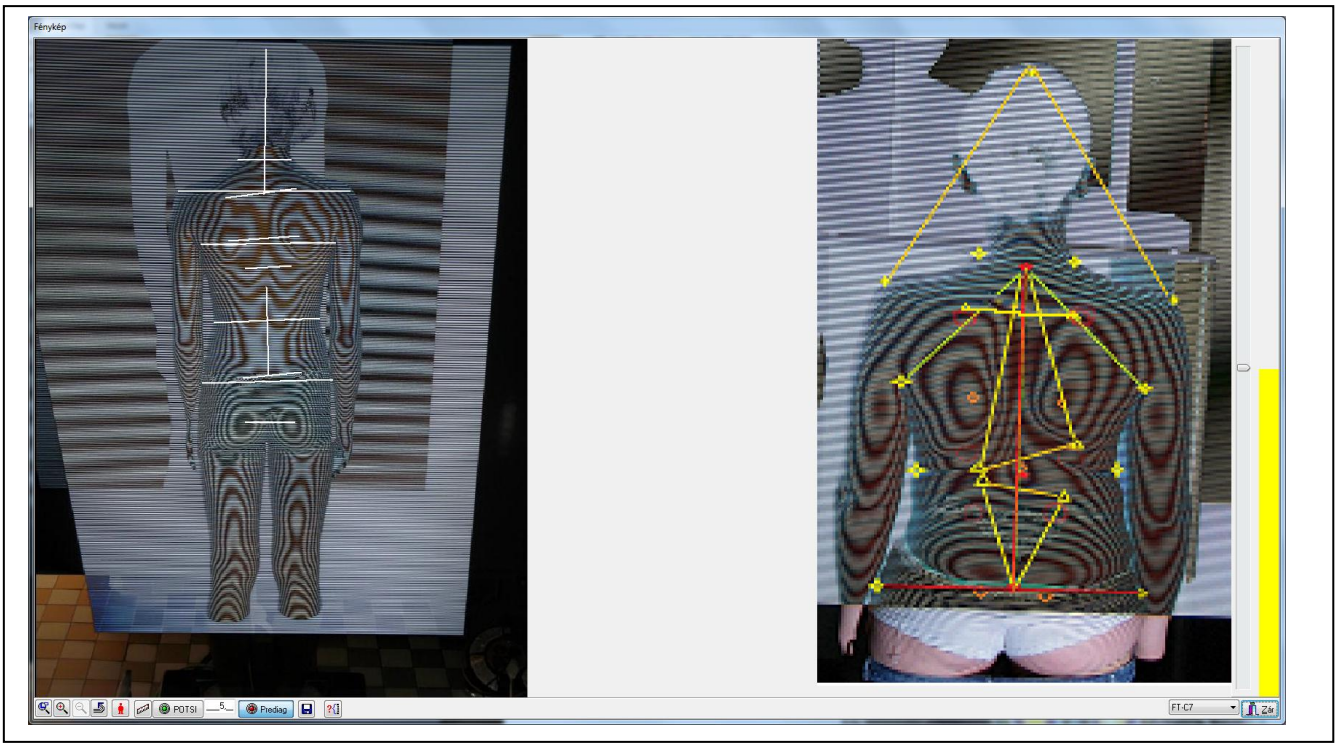


Image 11.

On image 12 it is shown, how the software diagnosed the correct sizes and informations visually. It is a full information data about the deformities.

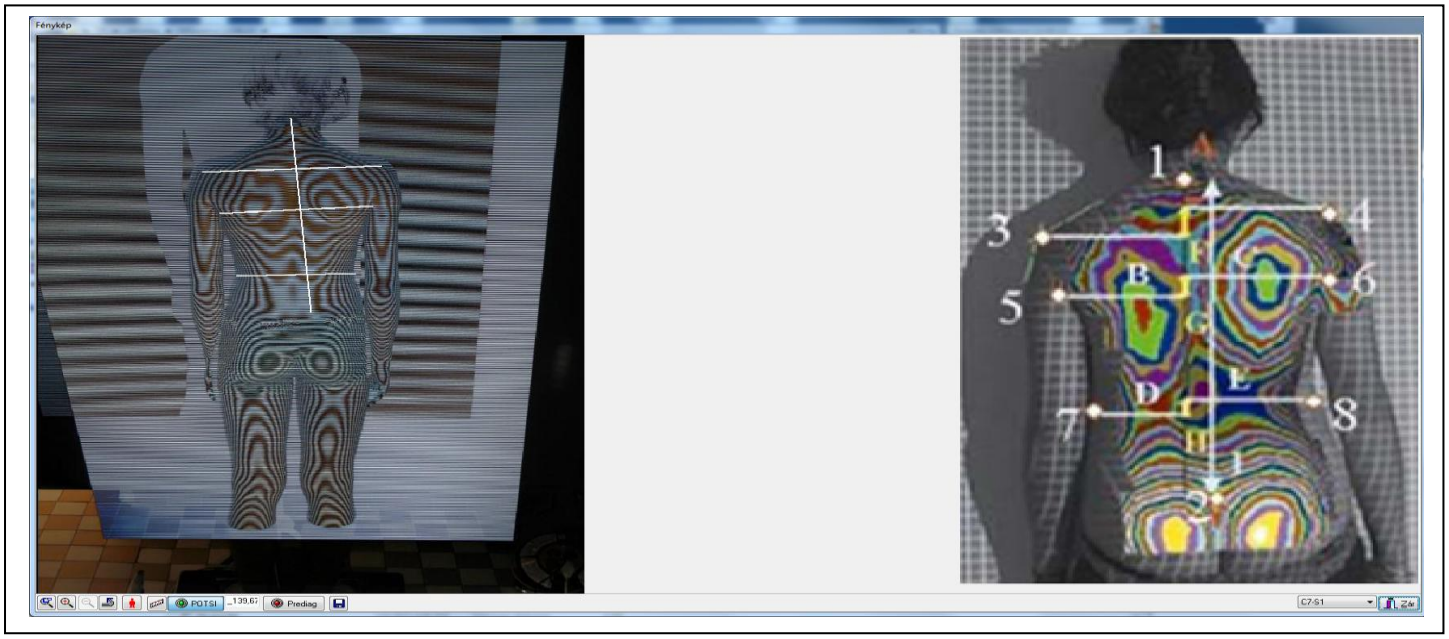


Image 12.

Than the software puts the measured data into a chart including the taken images.

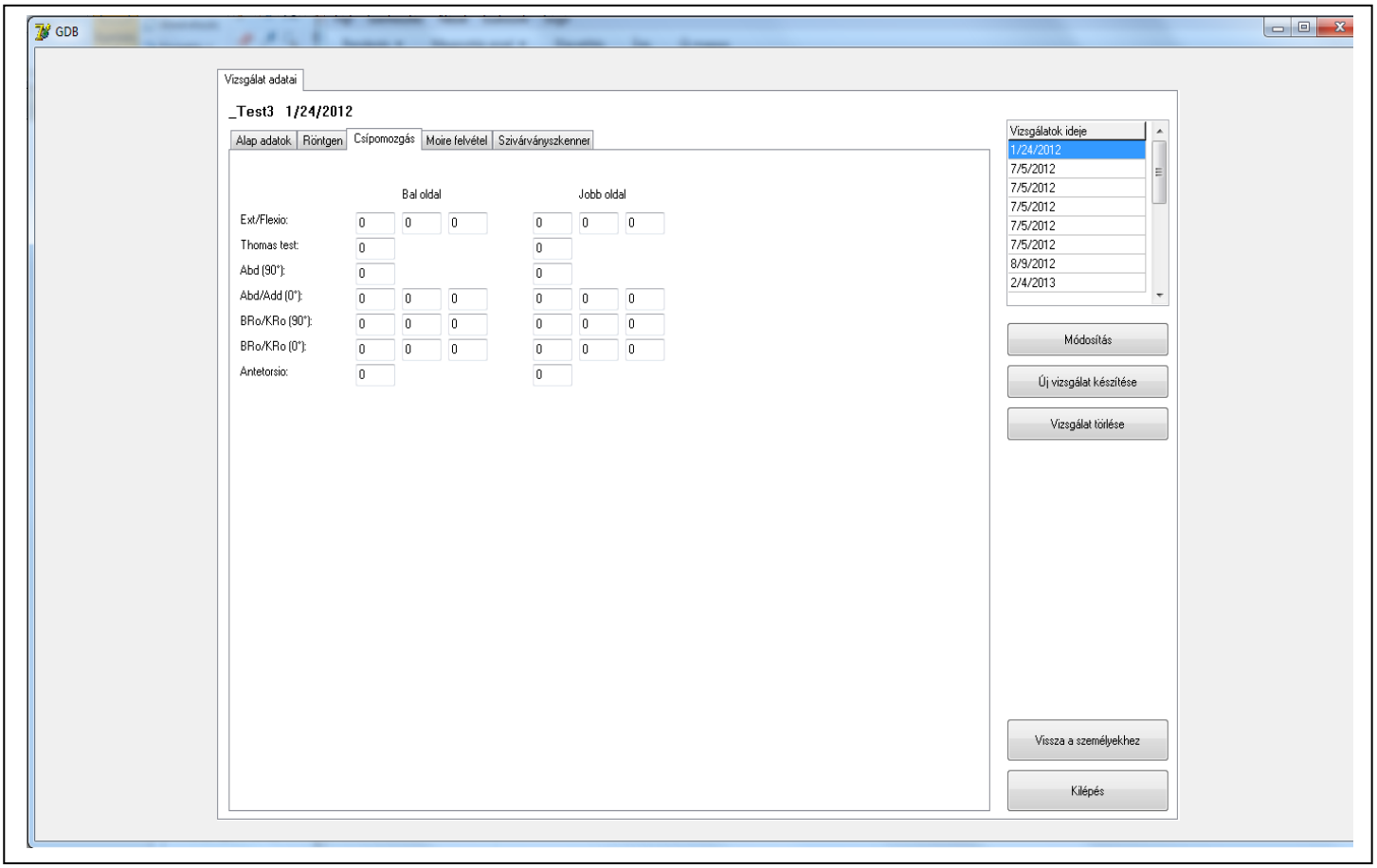


Image 13.

The software needed the development into the 3D technologies. Now we have the measurements, the 2D pictures, a database, and all needed informations. The exactitude of the examination is very high RTG, but still was not automatic, and by a creation of an orthopedic corset. We have created a Mobile equipment that can be easily, inexpensively manufactured. You can see the 3 dimensional accurate picture on image 14.

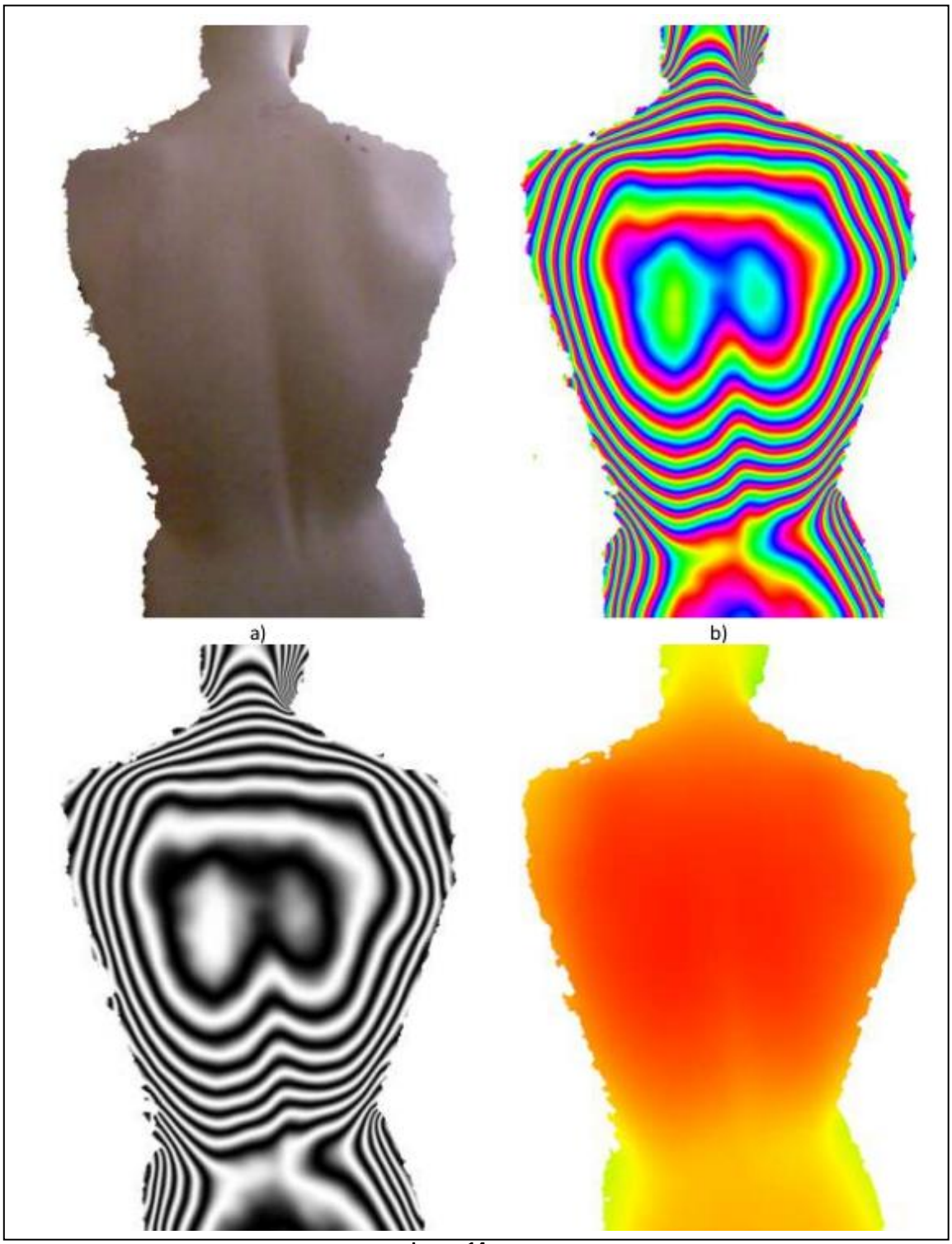


Image 14.

The 3D model is off course rotatable, so it makes it possible to create a any medical tool or corset for the patient, based on this. Shown on image 15.

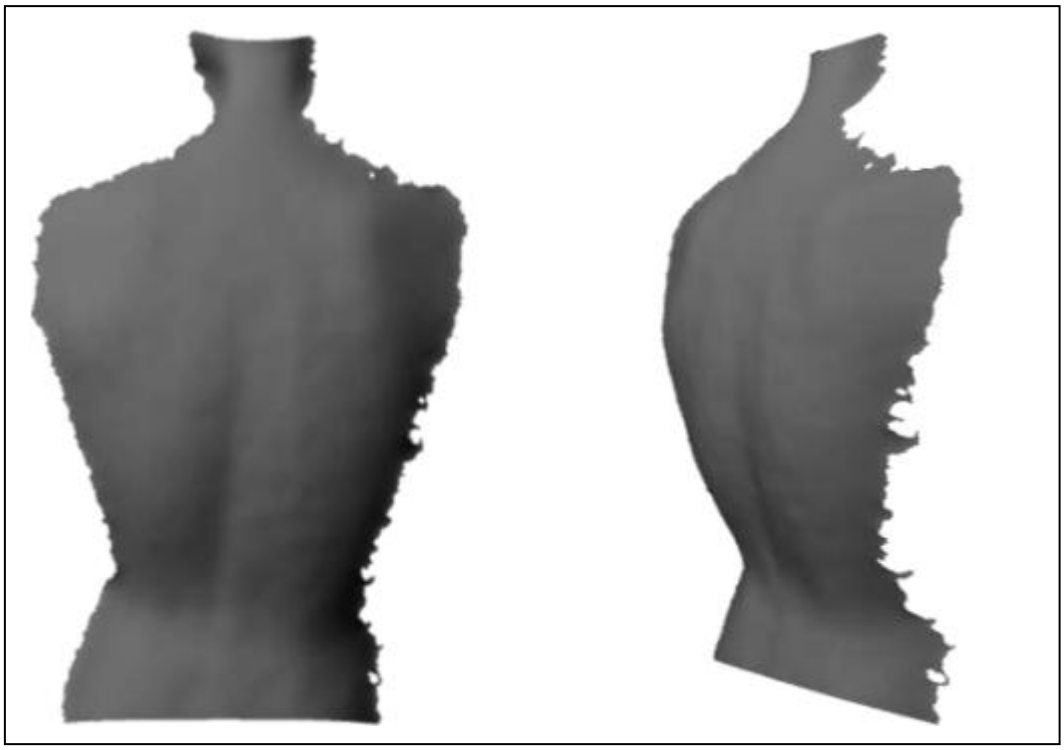


Image 15.

Further development possibilities are in the 3D Scan of the feet. This hasn't been finished yet, and that's why we will take it out from the final software until further developments needed. We have to create a special device, which is a turning 3D scanner for this project. Now based on our device the method works, and was tested, but it has no other options yet. We still think, there are possibilities in this project.

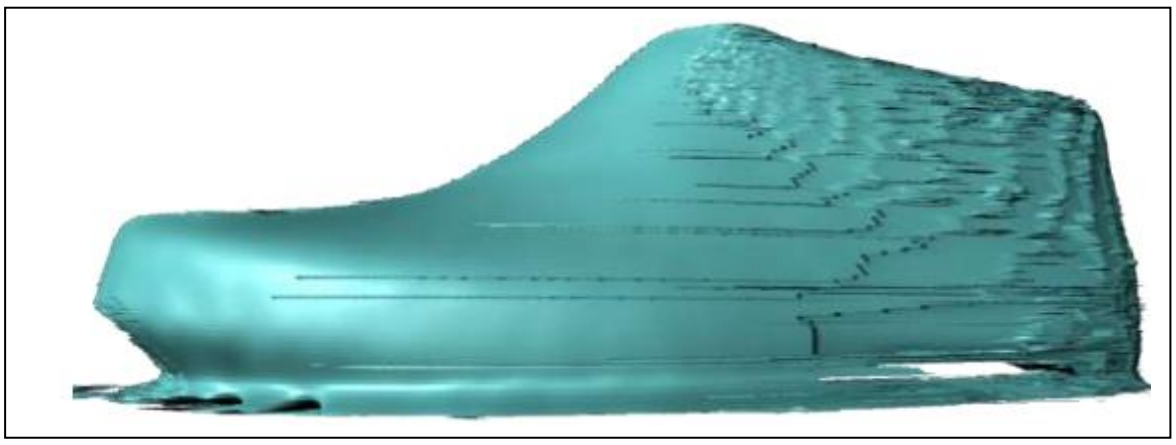


Image 16.

On image 17, you can see that with this method the software can calculate the tree for the shoes. So here returns the development to the original project. Thanks to this, it is now possible to use this 3D model of the shoes to create a tree for the shoewear. Thanks to the 3D model it will be easy to send the files to the CNC lathe machine to create the tree, thanks to the CAD CAM application, that is included into the software.

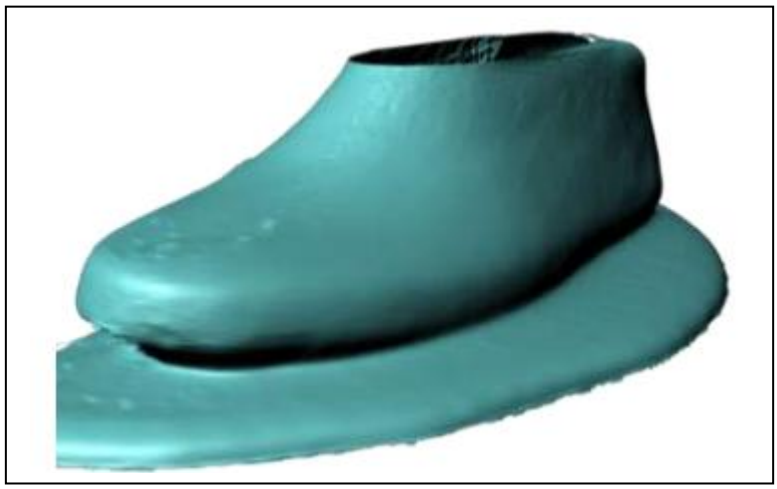


Image 17.

We can see any stereotypical files from other softwares in our project , thanks to the great advance, it is very easy. Now because of that it is a lot easier to create a corset or any other stiffeners. And also helpful to have this model in the case of medical examinations because the patient dosen't has to be directly at the place.

Image 18.

In this description we you could see two different methods for the medical usage of our project. This methods could help to the diagnosis and in the creation of medical tools. We've created some solutions for an easy to use, compact, fast and effective device with the right software background and a database for the use. Other methods are to expensive to solve the same problems similarly, and there is no development on the similar way, in this advanced stage. The scoliosis examining device works in practice already in the Heim Pal Hospital for children on the orthopedics clinic. The rotating scanner possibly will be ready in in the first half of 2013. The further updates, innovations for this software are available to the users online. The structural systematic way of the program makes it open for a lot more possibilities. The software is made for more new plug-ins for a full expandable software, so it will be easy to add any new modules (like the one for the rotating 3D scanner). The regulated interface is made to ease the codes, and more developers can work on the software at the same time.

Like in all development regarded to medical technology engineering and scientific results are important, but the most important part is, that all creations, and finished tools or projects should be very useful and helpful for the fellow humans, who need this solutions in use. So I hope, that all developements to time and later on will help in the life and health questions of many people.

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