A NEW SHAPE FUNCTION FOR SIMULATING A SINGLE FACIAL WRINKLE

By

NURAZLIN ZAINAL AZMI

Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science

August 2006

Dedicated to

my dearest mom and dad, and friends…..

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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August 2006

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Faculty: Computer Science and Information Technology

Many efforts have been taken to generate realistic facial modeling and animation. This is inspired by the increasing appearance of virtual characters in film and video, inexpensive desktop processing power, and the potential for a new 3D immersive communication metaphor for human-computer interaction.

Wrinkles are important for realistic facial animation and modeling because they aid in recognizing human's expressions as well as person's age. Different techniques have been used to generate wrinkles, whether it is fine-scale or large-scale wrinkles.

This research focuses on introducing a new shape function for simulating a single wrinkle. However, it does not take into account the facial animation, and hence the modeling is only concerns with the wrinkling process triggered by user interaction.

To carry out this research, a simple method that allows the user to control the shape and location of the wrinkle is used. The process involves two major steps. The first

step is to construct a face mesh, either by scanning through digital scanner or modeled by using a CG software and correctly upload it into the program.

The second step is to perform the wrinkling process. In this process, user will draw a stroke on top of the face mesh to represent the wrinkle by using the mouse. Points on the stroke are stored in a vector array and interpolated to obtain evenly closer distributed points.

Once this is done, the program is then required to find triangular meshes affected by the stroke drawn earlier and subdivide it into smaller triangular meshes. These triangular meshes need to be interpolated as well to produce evenly distributed points. Then, the wrinkle shape function is applied to the wrinkle points to see the effect of the wrinkle simulation.

In the end of this research, we will show that the research objective made is successfully achieved through the observation made by the third parties, and the wrinkle produced does meet the properties of real wrinkles.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

FUNGSI BENTUK BARU BAGI PENGSIMULASIAN SATU KERUTAN WAJAH

Oleh

NURAZLIN ZAINAL AZMI

Ogos 2006

Pengerusi: Rahmita Wirza Rahmat, PhD

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Pelbagai usaha telah dilakukan untuk menghasilkan model wajah dan animasi yang realistik. Ini telah didorong oleh pelbagai faktor seperti penggunaan karektor maya di dalam filem dan video, kuasa pemprosesan *desktop* yang murah, dan pembaharuan metafora komunikasi 3D bagi interaksi manusia-komputer.

Kerutan di wajah adalah penting kerana ia membantu di dalam pengecaman riak wajah dan juga umur individu tertentu. Pelbagai teknik digunakan untuk menghasilkan kerutan di wajah.

Kajian yang dilakukan ini menjurus kepada pengenalan fungsi baru untuk pengsimulasian satu kerutan. Walaubagaimanapun kajian ini tidak mengambil kira animasi muka tetapi hanya menumpukan kepada proses pengerutan melalui interaksi pengguna.

Di dalam menjalankan kajian ini, kami menggunakan kaedah yang mudah di mana pengguna boleh mengawal bentuk dan lokasi kerutan yang diingini. Dua peringkat

utaam terlibat di dalam melaksanakan proses ini. Peringkat yang pertama adalah untuk membina muka sama ada melalui imbasan digital atau dimodelkan menerusi perisian CG dan memastikan ia dapat dipaparkan dengan betul di dalam program kami..

Peringkat yang kedua pula adalah berkaitan dengan penghasilan kerutan. Di dalam proses ini, pengguna perlu melukis lokasi kerutan di atas muka 3D menggunakan tetikus. Titik-titik yang terhasil melalui pelukisan kerutan akan disimpan di dalam jujukan dan diinterpolasi untuk menghasilkan titik-titik yang sekata.

Seterusnya, proses ini memerlukan pencarian muka-muka segitiga yang terlibat dengan kerutan yang telah dilukis tadi. Muka-muka segitiga ini perlu dibahagikan lagi kepada muka-muka yang lebih kecil dan seterusnya diinterpolasikan sekali lagi untuk menghasilkan titik-titik sekata. Kemudian fungsi bentuk kerutan akan diaplikasikan kepada titik-titik yang terlibat untuk melihat kerutan yang terhasil.

Di akhir kajian, kami membuktikan bahawa objektif kajian yang dibuat ini telah berjaya dicapai melalui pandangan pihak ketiga dan kerutan yang terhasil memenuhi sifat-sifat kerutan wajah yang sebenar.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my greatest gratitude to the Al-Mighty for giving me faith and confidence to pursue this path.

To my supervisor, Dr. Rahmita Wirza Rahmat, thank you so much for all the guidance and patience you've shown through out this research. I appreciate that. To my co-supervisor, Dr. Ramlan Mahmood, thanks for all the advice you gave in order for me to complete this.

To Mr. M.N.Z., thank you for assisting me with the implementation. Not to forget programmers from MDC for their share of experiences. To all my friends who gave undivided supports, you are my inspiration in this journey. And to my beloved family, your blessed has made me come this far. Thank you from the very bottom of my heart.

I certify that an Examination Committee has met on 4th August 2006 to conduct the final examination of Nurazlin Zainal Azmi on her Master of Science thesis entitled "A New Shape Function for Simulating a Single Facial Wrinkle" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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NURAZLIN ZAINAL AZMI

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