

Virtual Undergraduate Town Hall FAQ
Accelerated Cloth Simulation for Virtual Try-On
Speaker: Tanya Amert, Host: Lori Pollock
7/14 at 4pm ET

Why do you use triangles (instead of some other shape) when you create your accelerated cloth simulation?

- There is some work using quadrangles, but triangles are much more common; most of the work in this field uses triangle meshes. Not only are triangles guaranteed to be planar (unlike more complex shapes such as quadrangles), but graphics hardware like GPUs are also designed to quickly process triangles. Another approach, which is completely separate from the work I am currently doing, uses what's called a "mass-spring" model, where you end up with little balls representing mass and you connect them with a bunch of springs, and even then it ends up looking a lot like triangles, and is often still rendered using triangles.

How does cloth simulation differ from what is done in games' collision?

- One thing that makes it different is that in a game, they will often check for some collisions, but not others. For example, they might check if my character runs into a wall, but not for a sword interacting with a cloak (and often the cloak simulation might be pre-animated). Cloth collision detection is often a complex and time-intensive process, so they often try to cut as many corners as possible to achieve interactive speeds.

Is it easier to do cloth simulations for certain parts of the body, rather than others (shirts vs. pants)?

- Regions with simple geometry, such as flat sections of t-shirts or pants, are easier than complex regions like shoulder seams or flowy skirts. Draping and wrinkles are hard to simulate. As a result, long sleeves and more complex, or even layered, skirts add complexity and time.

What programming languages do you use to do this kind of research?

- C++ is the most common. I use OpenGL for visualization and for debugging of simulations. I tend to switch around depending on what I am doing, so I do use C# and Python as well. The simulation itself is a lot of code, so I use Visual Studio as my development environment. After calculating triangle positions in the simulation, I use Blender to render the triangles to make output images.

Did you look to video games, like the Sims, to assist in developing your simulation?

- For the cloth simulation, not as much. The focus is on the current state of the art, and how we can make it faster. While I might have thought about various video games I've played subconsciously, I have not knowingly looked at video games to develop the simulations.

What is unique to cloth simulations?

- There are big differences between cloth simulations and face simulations, for example, because you are constrained (in regards to face simulations) to the muscle groups that guide the skin movement. For cloth simulations, we can take some short cuts; we don't need every collision, so we can skip some, unlike really complex and accuracy-dependent simulations such as car crash tests. Also, it is really hard to produce clothing simulations, as people often wear multiple layers of clothing. However, clothing is worn on a body, so we do know a little bit about how it sits and flows, unlike general cloth simulations.

How do you imagine this technology being used by people?

- Right now, I can see people using this in their home. For example, if you have an Xbox Kinect, and online shops provided a mesh of their clothing, we could simulate it using information about their body shapes gathered from the Kinect input. It would be nice if you could have a dressing room in your house, but we are a long ways away from this being a full reality.

In regards to the GRE, how many hours do you recommend I should spend on studying for the GRE?

- Applying this year, start GRE and your statement of purpose now. If you are applying next year, I would start GRE now, and work on weaknesses discovered from taking practice tests. You can also install apps on your phone to help practice vocab. In regards to our statement of purpose, you can write a draft now and come back to it later. Don't leave your statement of purpose to the last minute.

How many schools did you apply to?

- The first time I applied, I applied to 5 schools. I based my decision on rankings as opposed to research interests, and did not get into any. The second time I applied, I applied to 7 schools, I got into 3 schools. The ones I got into, my letter writers knew people, which I think helped my application to get more visibility.

Did you reach out to the professors that you had identified doing research in your area of interest, prior to applying?

- I only did one, but I wish I had done more. I kept putting it off because I didn't know how to write the email. I think it helps so much when they have seen your name before they get the application.

How did you choose the area of research to write about in your statement of purpose, if you don't have that many research experiences or the past experiences were not a good fit for you?

- I knew I wanted to do graphics, but I had no real research experience in that area. I thought back to which projects/topics I had enjoyed most in my undergrad graphics class, and I was able to narrow it down to 3 topics that I thought I was interested in. I then looked at the schools and figured out what they had done a lot of. If you know that you are interested in one specific area, you could look up the homework at different schools; I found a fun assignment that was interesting, and used that to find recent related papers to see what they talked about for future work. When I looked at different schools, I tried to find ones that were similar, and I mentioned how my interests (cloth/fluids/hair, especially the combination of two or more) would be useful to their future work.

Concerning career trajectory, how different is a PhD in IS and CS?

Different IS programs have different curricula, while CS programs are more closely related. For example, sometimes research fields such as HCI and software engineering are in IS departments and sometimes in CS departments. The career trajectory is more dependent on the field of research and student goals than department/degree.

Did you take additional CS courses when applying as you mentioned your bachelors was in a different engineering area?

My bachelor degree was in Electrical Engineering & Computer Science, which required a lab class and software engineering experience, and I also minored in Applied Math, so my background was fairly related to my current work. That said, I did take a graduate graphics course at UW while I was working full time, which helped me refresh the material and gain additional perspectives.

How passionate about teaching should someone portray themselves as when applying to a research university?

Many students go to graduate school to be either a faculty member or industry researcher or other career. It is most important to show that you are interested in research, as well as teaching, if that is also one of your passions. Every department recruiting committee has different views on what they are looking for in their potential graduate students. It is difficult to predict what each committee is looking for. So, a safe approach is to show your

passion for teaching but not at the detriment of getting involved in research at least during graduate school.

What did you do for the year in between application rounds?

I was still working fulltime at Microsoft, so I continued my work there. However, I also talked to my manager and arranged an odd schedule for a quarter so that I could take the graduate Graphics class at UW. In my spare time, I re-thought out my statement of purpose (I started my first draft in July of my second application cycle), and also worked on a fluid simulation, which I hadn't done before, as a side project. This side project was actually really helpful for applications - some professors were not only surprised that I had done this while also working full time, but also that I took the time to add unit tests to some of the more complicated regions (I had challenged myself to three months of one-commit-each-day to a personal github project).

When should I start to apply? For example, I'll graduate at December 2017, when should I start?

That really depends on when you want to start school. Some places do have spring entry, but I'm less familiar with those programs and their deadlines - you can look at thegradcafe.com (enter at your own peril; there is a lot of material and discussion there, but watching acceptances trickle in is nervewracking) forums where people have probably talked about it. For fall 2018 entry, you'll want to apply during the Sept.-Dec. 2017 timeline.

My undergrad internships (2) have focus on robotics thus far, because I'm not free to travel for family reasons, and they were available locally. Do you think seeking a program of study that varies from previous experience risks app refusal?

No, the important thing is that you got involved in some kind of research, experienced the process, and show some promise and interest in continuing research in graduate school. From my experience, willingness to learn and passion goes a lot further than perfectly-aligned experience.