

# **Computer Animation and Games I**

## **Coursework 1 and 2 Semester 1 2017/18**

**Yongliang Yang**

### **Assessment**

This Unit is assessed 100% by coursework and has two parts, both of which are individual and are worth 50% of the total mark. Any significant input from others should be acknowledged and will not in itself contribute to the mark – the university's plagiarism rules apply.

### **Coursework 1 Deadline: Friday November 24<sup>th</sup> 2017**

Submit a compressed file containing your report and code via Moodle by the deadline. The report should have a front page clearly identifying the Unit and its code; showing the name of the unit leader; with your name and the name of your degree programme.

### **Assignment**

Explore inverse kinematics using a linkage in 2D space. Each joint of the linkage should be constrained to be a simple hinge. The whole linkage does not need to be any more complicated than Luxo Jr. There is no expectation of high realism: each link can be a simple rod. That said, if you are feeling adventurous, make your result as complicated as you like (but ensure the contents of this document are in place first). The linkage should have at least 3 rods.

The following properties are to be explored.

1. Some way of indicating where the remote end of the linkage can be moved in 2D space.
2. A way to change the physical properties such as rate at which the joints can change and the slow-out and slow-in of the movement of the end of the linkage as it leaves its current position and approaches the target position respectively.
3. Whether to model and thereby vary the flexibility of the rods.

You should write your own program built on top of any programming language. We highly suggest using MATLAB if you are not already familiar with another graphics and mathematics language (e.g. OpenGL), as this will reduce the amount of coding you need to learn and allow you to focus on the mathematics. Some of the libraries have been made available to you in the laboratory, such as MATLAB, Microsoft Visual Studio. Please talk to the unit leader if you are unsure, and we will create a discussion forum on Moodle with other suggestions.

Should you choose to use your own machine you are reminded to back up very regularly onto BUCS disks. The university will not accept a fault in your own machine as a legitimate reason for not completing the project. You are encouraged to seek feedback as the work proceeds.

After the submission deadline you will be marked on a short presentation/demo (in which the marker will need to see code running with you presenting). The report should be maximum 10 pages including any diagrams and/or screenshots (note: you can include further experiments and results in your digital submission). The report should set out the decisions taken and the methods explored (there is no need to give *all* the mathematics but you must give an explanation which demonstrates clear understanding of it – you may (if appropriate) keep the length within bounds with relevant reference to the literature and/or web sites). You should include a discussion and conclusion concerning point 3.

## **Coursework 2 Deadline: Friday January 19<sup>th</sup> 2018**

Submit one paper report each via Moodle. The report should have a front page clearly identifying the Unit and its code; showing the name of the unit leader; with your name and the name of your degree programme.

### **Assignment**

Use the academic literature to survey and critique one of the topics below. If you would like to propose your own topic, please talk to the unit leader first for approval. You may also refer to commercial products if you need to. You need to demonstrate an understanding of the subject chosen, not just provide a list of papers.

You have a free choice of whether to survey the early work which helped shape the subject, the later work which is the current state of the art, or whether to do an overview from older to recent. Which you choose may depend on the topic so we recommend you explore somewhat before deciding which way to go. You also need to make a judgement on what is a reasonable length of survey in the time available – but in the region of 3000-4000 words (excluding References section) is fine, you should not submit significantly more without a good reason (overly long submissions will be marked as harshly as overly short). Your experience with the under-graduate dissertation may help here.

### Topics

Implicit modelling and its uses in animation and games

Freeform deformation and its uses in animation and games

Modelling and rendering fluids

Modelling and rendering of fur and hair

Human and human-like faces

Motion capture of humans for movie and/or games

Modelling and rendering crowds

The survey format is flexible. As guidance, you may use the format of existing literature survey reports:

[1] H.-Y. Shum and S. B. Kang, A review of image-based rendering techniques, Proc. SPIE Visual Communications and Image Processing, pp. 4067:2-13, 2000.

[https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/review\\_image\\_rendering.pdf](https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/review_image_rendering.pdf)

[2] T. B. Moeslund and Erik Granum, A Survey of Computer Vision-Based Human Motion Capture, Computer Vision and Image Understanding, vol. 81, no. 3, pp. 231-268, 2001.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.108.203&rep=rep1&type=pdf>

[3] L. Kobbelt and M. Botsch, A survey of point-based techniques in computer graphics, Computers & Graphics, vol. 28, no. 6, pp. 801–814, 2004.

<https://www.graphics.rwth-aachen.de/publication/105/points1.pdf>

### Feedback

Feedback on Coursework 1 will be provided shortly after your presentation, which will be arranged shortly after the Moodle submission date. Feedback will consist of a mark and key comments regarding the understanding and implementation of relevant animation and gaming techniques (as shown on the syllabus).

Feedback on coursework 2 will be provided no later than 15 in-semester days after the hand-in date. Feedback will consist of a mark and key comments against the following learning criteria (as shown on the syllabus):

- Critically scope and specify the technical requirements for a major project.

In this part of the coursework, you are to imagine that the literature survey is to be used as input to help scope and identify a relevant major project. You are not required to design or specify a particular project.