INFO-H502 project

… and some historical facts

INFO-H502 project “guidelines”: max scores (when everything well implemented)

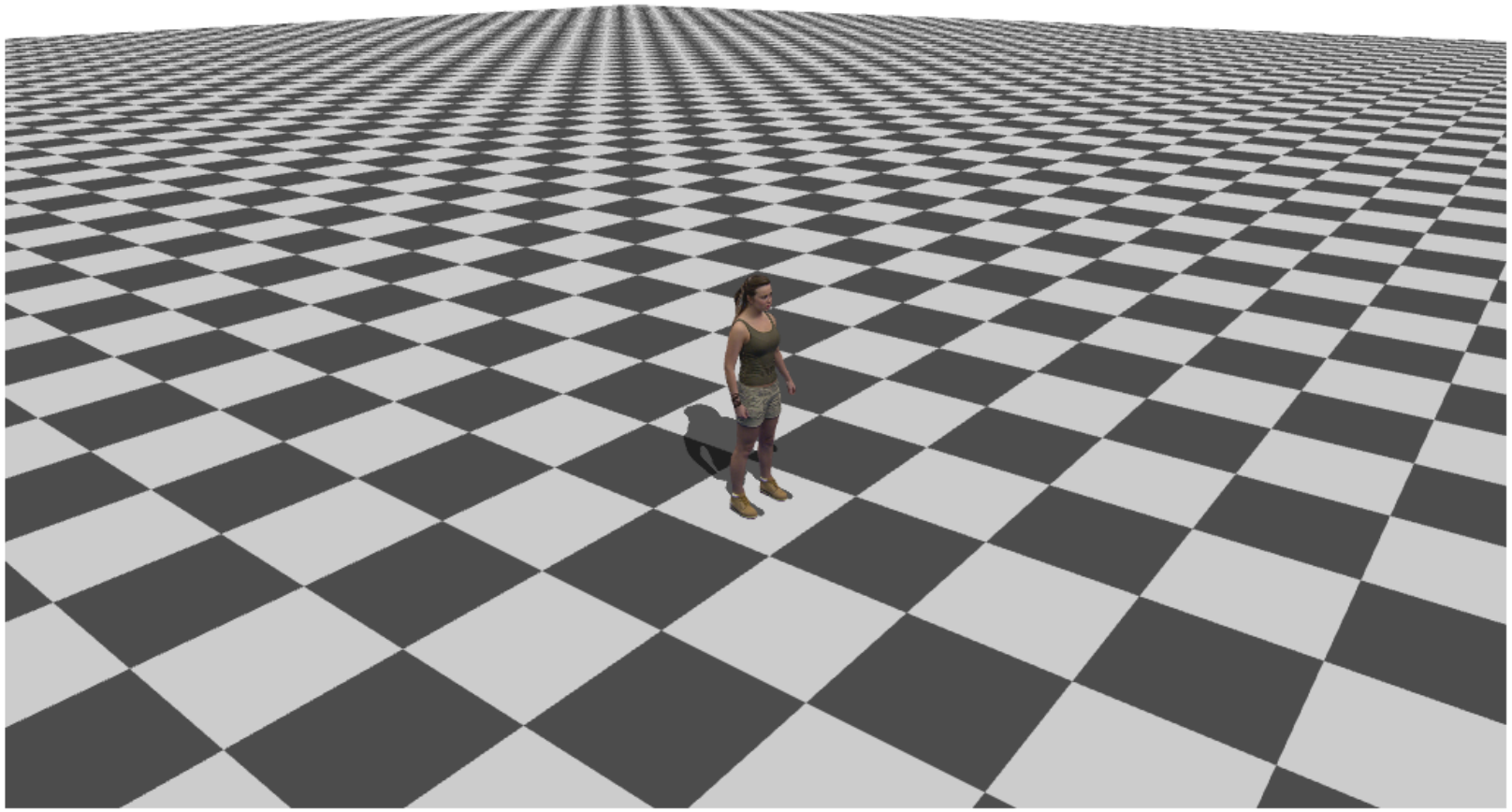
- Simple animation like earth turning around sun with diffuse and specular light + skybox: max. 10/20
- Transparent objects or mirrors ≤ +1
- Particle system ≤ +1
- Bump mapping ≤ +1
- Simple animation (e.g. keyframe buffer) ≤ +1
- Skeleton animation with skinning ≤ +2
- Simple collision detection (e.g. snooker table) ≤ +1
- Bullet collision detection ≤ +1, +2
- Geometry shader (or compute shader) ≤ +1, +2
- Shadows ≤ +1, +2
- Others (e.g. aesthetic, AI, special effects in shaders, etc.) ≤ +1, +2, …

PS: depends also on number of students in project

WebGL character animation

https://cvssp.org/projects/4d/webGL/CAE.html?char=Character1

Free-viewpoint Video-based Character Animation Engine - WebGL Demo



A WebGL Demo to showcase Free-viewpoint video-based Character Animation Engine (WebGL enabled browser is required, e.g. firefox). This has been developed as part of the EU funded FP7 project RE@CT.

Navigation of the scene can be performed using either the mouse or the keyboard up/down/left/right to control the viewport

+/-	Zoom In/Out
p	Play/Pause
t	Texture/Normal Map
q/a	Parametric Motion Control
0,1,2,3,4,5	Change Between Motions

Stand | Walk | Jog | Tense | Stagger | Hit

Render Information

Status:	Playing
Character:	Character1
Motion:	Stand
Frame Rate:	28 FPS
Viewpoint:	2.23 -1.19 7.00
Load Time:	42043 ms

WebGL character animation

https://cvssp.org/projects/4d/web3D/VolinoWeb3D2015.pdf

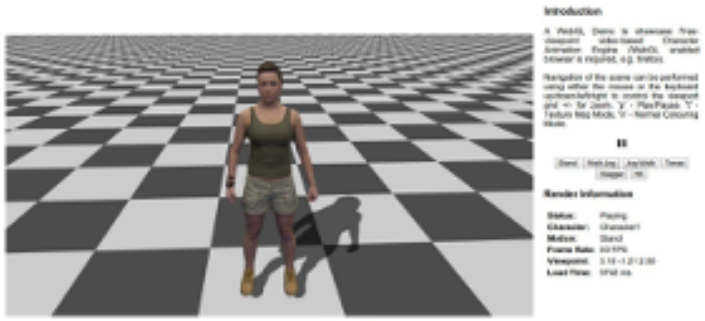
Dataset	Captured Data (MB)	Frames (Motions)	Processed Data (MB)			Polygon Count	Runtime		
			Geometry	Texture	Total		RAM(MB)	Load Time(s)$^{+}$	FPS Range
Dan	6800	254 (8)	12	27	39	5330	220	30-60	30-70
Roxanne	9500	432 (10)	20	31	51	4950	350	30-60	30-70
Ballet	60300	3301 (9)	304	1*	305	9996	1700	>120	30-70

Table 1: *Overview of datasets and storage requirements of captured and reconstructed data. *Due to the number of frames a single texture map was applied to all frames. $^{+}$Loading times are dependent of internet connection speed.*

4 Results

In order to test the framework, three characters were processed and rendered using the WebGL animation engine. An overview of each character scenario is given below.

Character Dan
A male character in a red and black sweater, dark jeans and brown shoes was captured performing typical game character motions, e.g.



Rodrigues equation

Olinde Rodrigues

From Wikipedia, the free encyclopedia

Benjamin Olinde Rodrigues (6 October 1795 – 17 December 1851), more commonly known as **Olinde Rodrigues**, was a French banker, mathematician, and social reformer. In mathematics Rodrigues is remembered for Rodrigues' rotation formula for vectors, the Rodrigues formula about series of orthogonal polynomials and the Euler–Rodrigues parameters.

Contents [hide]

Benjamin Olinde Rodrigues

Born	6 October 1795 Bordeaux, France
Died	17 December 1851 (aged 56) Paris, France
Alma mater	University of Paris

Biography [edit]

Rodrigues was born into a well-to-do Sephardi Jewish family in Bordeaux.[1] He was awarded a doctorate in mathematics on 28 June 1815 by the University of Paris.[2] His dissertation contains the result now called Rodrigues' formula.[3]

After graduation, Rodrigues became a banker. A close associate of the Comte de Saint-Simon, Rodrigues continued, after Saint-Simon's death in 1825, to champion the older man's socialist ideals, a school of thought that came to be known as Saint-Simonianism. During this period, Rodrigues published writings on politics, social reform, and banking.

In 1840 he published a result on transformation groups,[4] which applied Leonhard Euler's four squares formula, a precursor to the quaternions of William Rowan Hamilton, to the problem of representing rotations in space.[5] In 1846 Arthur Cayley acknowledged[6] Euler's and Rodrigues' priority describing orthogonal transformations.

Rodrigues is credited as originating the idea of the artist as an avant-garde.[7]

Rodrigues equation

JOURNAL DE MATHÉMATIQUES PURES ET APPLIQUÉES

RODRIGUES

Des lois géométriques qui régissent les déplacements d'un système solide dans l'espace, et de la variation des coordonnées provenant de ces déplacements considérés indépendamment des causes qui peuvent les produire.

Journal de mathématiques pures et appliquées 1re série, tome 5 (1840), p. 380-440.

<http://portail.mathdoc.fr/JMPA/afficher_notice.php?id=JMPA_1840_1_5_A39_0>

Cook-Torrance light equation

Awardee(s):

Kenneth E. Torrance

Award:

Computer Graphics Achievement Award

Description:

The SIGGRAPH Achievement Award is presented to Dr. Kenneth E. Torrance in recognition of his contributions in the fields of radiosity and physically-based reflectance models. These contributions are the underpinnings of the majority of computer graphics images produced during the past fifteen years.

Kenneth Torrance received his Bachelor's (1961), Master's (1962) and doctoral (1966) degrees in Mechanical Engineering from the University of Minnesota, where Ephraim Sparrow served as his graduate advisor. He was a visitor at the National Institute for Standards and Technology in Washington, DC, and the National Center for Atmospheric Research in Boulder, Colorado. Dr. Torrance is Professor of Mechanical and Aerospace Engineering at Cornell University, Ithaca, New York where he has also served as Associate Dean of the College of Engineering. A Fellow of the American Association of Mechanical Engineers, he has nearly ninety publications in the fields of combustion, heat transfer, experimental and computational methods, and realistic image synthesis in computer graphics. His work has included interdisciplinary studies in such fields as destructive fires, environmental and geophysical fluid motions, and industrial thermal management.

Dr. Torrance was known to the computer graphics community before the computer graphics community was known to him. Jim Blinn initially employed the Torrance-Sparrow model as the first application of a physically-based reflectance model in 1977. Dr. Torrance subsequently collaborated with Rob Cook in 1980 to apply a more complete version of this model.1 In 1991, with Sheldon He and others, Torrance improved the model and compared and verified the results with experimental values.

These contributions became even more significant when, over a period of several years, he and Don Greenberg collaborated to guide many students who developed and expanded the radiosity approach to rendering. Radiosity represented a new and important basic paradigm for rendering. It is based on a global model of the interaction of light and surfaces. The complexity of these interactions of light with many surfaces was previously considered intractable. Torrance provided the guiding light and scientific leadership over more than a decade of critical development of this new paradigm. Torrance's seminal work inspired other computer graphics researchers at several institutions to explore this new approach.

Indeed, we might well say that Torrance is the father of radiosity in computer graphics.

Source:

ACM SIGGRAPH Citation

Hamilton's quaternions

5 Appendix: Letter from Sir W.R.Hamilton to Rev. Archibald H. Hamilton

Letter dated August 5, 1865.

MY DEAR ARCHIBALD - (1) I had been wishing for an occasion of corresponding a little with you on QUATERNIONS: and such now presents itself, by your mentioning in your note of yesterday, received this morning, that you "have been reflecting on several points connected with them" (the quaternions), "particularly on the Multiplication of Vectors." (2) No more important, or indeed fundamental question, in the whole Theory of Quaternions, can be proposed than that which thus inquires What is such MULTIPLICATION? What are its Rules, its Objects, its Results? What Analogies exist between it and other Operations, which have received the same general Name? And finally, what is (if any) its Utility? (3) If I may be allowed to speak of myself in connexion with the subject, I might do so in a way which would bring you in, by referring to an ante-quaternionic time, when you were a mere child, but had caught from me the conception of a Vector, as represented by a Triplet: and indeed I happen to be able to put the finger of memory upon the year and month - October, 1843 - when having recently returned from visits to Cork and Parsonstown, connected with a meeting of the British Association, the desire to discover the laws of the multiplication referred to regained with me a certain strength and earnestness, which had for years been dormant, but was then on the point of being gratified, and was occasionally talked of with you. Every morning in the early part of the above-cited month, on my coming down to breakfast, your (then) little brother William Edwin, and yourself, used to ask me, "Well, Papa, can you multiply triplets"? Whereto I was always obliged to reply, with a sad shake of the head: "No, I can only add and subtract them." (4) But on the 16th day of the same month - which happened to be a Monday, and a Council day of the Royal Irish Academy - I was walking in to attend and preside, and your mother was walking with me, along the Royal Canal, to which she had perhaps driven; and although she talked with me now and then, yet an under-current of thought was going on in my mind, which gave at last a result, whereof it is not too much to say that I felt at once the importance. An electric circuit seemed to close; and a spark flashed forth, the herald (as I foresaw, immediately) of many long years to come of definitely directed thought and work, by myself if spared, and at all events on the part of others, if I should even be allowed to live long enough distinctly to communicate the discovery. Nor could I resist the impulse - unphilosophical as it may have been - to cut with a knife on a stone of Brougham Bridge, as we passed it, the fundamental formula with the symbols, i, j, k; namely, $i^2 = j^2 = k^2 = ijk = -1$ which contains the Solution of the Problem, but of course, as an inscription, has long since mouldered away. A more durable notice remains, however, on the Council Books of the Academy for that day (October 16th, 1843), which records the fact, that I then asked for and obtained leave to read a Paper on Quaternions, at the First General Meeting of the session: which reading took place accordingly, on Monday the 13th of the November following.

With this quaternion of paragraphs I close this letter I.; but I hope to follow it up very shortly with another.

Your affectionate father,

WILLIAM ROWAN HAMILTON.