



GAME2016

Mathematical Foundation of Game Design and Animation

Lecture 1

Course Overview

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Senior Lecturer @HKBU Department of Interactive Media



Course Overview

Contact Information

- Lecturer

- Dr. Paolo Mengoni

- Email: pmengoni@hkbu.edu.hk
- Consultation hours: by appointment



Who am I

Paolo Mengoni, PhD

IT Professional – Computer Science Researcher

■ Senior Lecturer

- Department of Interactive Media - School of Communication - Hong Kong Baptist University



■ Background

- PhD in Computer Science, University of Florence & University of Perugia, Italy



Who am I

- Research interests
 - Behavior Modeling
 - Community Detection
 - Graph Analytics
 - Natural Language Understanding
 - Emotion Recognition
 - Semantic Analysis
- Certified IT Engineer and Medical IT Expert
- 20+ years of experience of IT Consultancy



Where I am From

- Italy!



<http://www.vidiani.com/large-detailed-illustrated-tourist-map-of-italy/>

Where I am From

- Perugia!



<http://www.vidiani.com/large-detailed-illustrated-tourist-map-of-italy/>

Where I am From

- Perugia! [[Video](#)]



Is this course easy?



- This course (may) be hard...

Is this course happy?



- You will learn a lot of new and useful things
 - This course is informative and helpful!
- Maybe some Italian too!

What is this course about?

- Basic mathematical foundation
- Formal logic underpinning mathematics in general
- Basic mathematical notions of vector, matrix, linear algebra, geometrical transformations in 2D and 3D
- Motion of objects on the screen
- Combinatorics and probability theory to enrich game designs and animations with stochastic behaviors and random outcomes

Course Objectives

- Course aims to
 - Explain the fundamental concepts and principles of the mathematical topics covered;
 - Perform basic deductions based on the mathematical principles covered to solve a mathematical problem;
 - Explain the mathematical approaches used in the context of game design and computer animation;
 - Apply the theories and concepts to model similar mathematical problems in game design and animation.



This course is interdisciplinary

- Visual approach to Mathematics using Computer Science for Game Development and Animation
- In the lectures will have a mathematics theory component and a computer programming component
- We will:
 - Use a series of problem-based, practical exercises
 - Explore ideas about drawing graphics on a screen and how to implement physics techniques such as collisions and particle emitters
 - Apply vectors, vertices, matrices to 2D and 3D graphics
 - Use Python and its libraries to solve mathematical problems

Course Information & Topics

- Time & Venue

- Wed 12:30-15:20 (CVA203)

- Three modules (tentative schedule):

- Coordinates and Vectors (Week 1-3)

- Matrices and Transformations (Week 4-9)

- Advanced Math in GDA (Week 10-11)

Assessment Structure



Assessment	Weight
In-Class Exercises	30%
Assignments	30%
Final Exam	40%

Assessment

- In-Class Exercises (30%)
- Exercises will be given and completed during the class:
 - (ir-)regular small quizzes and exercises
 - When? Week 1-11
 - Students are expected to punctually and actively participate the discussion during lecture and project-based consultation meetings
 - When? Always



Assessment

- Assignments (30% total)
 - Applications of mathematics to game design and animation problems (20%)
 - Students will be assigned in a group to investigate applications of mathematics in game design and animation
 - Deliverables will include a written report and delivery of 10 to 20 minutes in-class presentation
 - Individual reflections and peer evaluation (10%)
 - The students will provide anonymous feedback to peers (100-200 words in English)
 - The students will critically evaluate and reflect on their group work (200-300 words in English)
- When? Week 9-11

Assessment

- Examination (40%)
- Written exam
 - Final Examination questions, which may include case studies, exercises, and essay questions, are designed to evaluate how far students have achieved their intended learning outcomes.
- Open book (tentative)
 - Open book in the sense that you can bring a single A4 paper **handwritten** with your notes.
- When? During or just before University exam period (after week 11)



Assessment

■ Plagiarism

- Pay attention to the University's academic regulations rules and guidance notes regarding **academic integrity and plagiarism**
- The University may take disciplinary actions against students when there is evidence of collusion between individuals.
- The work of others which is included in the assignment must be attributed to its source
 - sources citations
 - bibliography referencing
- Failure to observe such requirements may lead to serious consequences for your study in this course and your registration at the University.

Assessment

- Use of GenAI for assessment tasks
 - We will follow the University Guidelines for Use of Generative AI Tools
 - Each assignment guidelines will advise you when the use GenAI is allowed or restricted
- The principles of transparency and reflection should guide you
 - Transparency:
 - Explicitly acknowledge the use of GenAI tools
 - Explain the process
 - Record the prompts
 - Reflection:
 - What did you learn from the assistance of generative AI tools?
- Improper Use of Generative AI Tools
 - Presenting the output of GenAI tools as your own work is a violation of the University's guidelines for students on academic integrity
- The following methods might be used to check your work:
 - Request GenAI records of use
 - Request drafts of your work
 - Request to be orally examined on your submission

Group Activities

- Grouping: 4 students per group
 - depends on final enrolment
- Group List Deadline: The group leader (ONLY) should send the group list via email by **23 September** including the following information
 - Group leader name, responsible for the communications
 - Group member names and student IDs

Group Activities:

Teamwork will be evaluated
Do NOT simply combine individual part

Textbooks and Readings

- Fletcher Dunn, & Ian Parberry. (2011). 3D Math Primer for Graphics and Game Development, 2nd Edition. A K Peters/CRC Press.

[Link at HKBU Library](#)

- Penny de Byl. (2022). *Mathematics for Game Programming and Computer Graphics*. Packt Publishing.

[Link at HKBU Library](#)

- Available on HKBU Library catalog

Class Rules

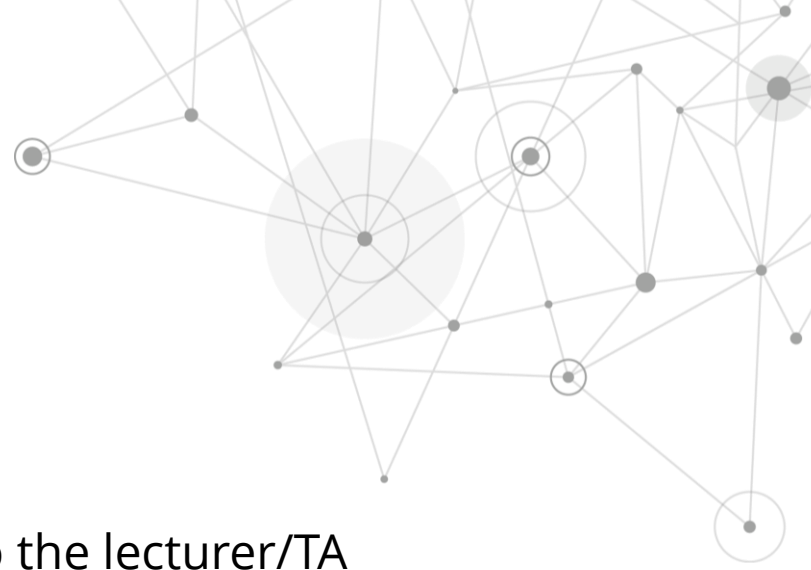
- In-class rules

- “Silence is golden”

- as long as you keep quiet...
- ...except if you want to ask questions to the lecturer/TA

- Eating and drinking?

- Not allowed by University regulations



Am I getting lost?

- Ask for help as soon as possible
- Compare with your peers
- Ask the instructor

