Essay Proposal

COMP110 - Computer Architecture Essay

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Topic

My essay will be on convexity-based collision detection algorithms for a 2D game engine.

Paper 1

Title: An Improved Algorithm of Collision Detection in 2D Grapple Games

Citation: [1]

Abstract: "The goal of collision detection is to automatically report interference between two or more geometric objects in static and dynamic environments. We introduce a new approach to the problem of collision detection in 2D Grapple Games. The objects for collision detection are bounded by the axis-aligned rectangle and circle for a tightly fitting the objects' shapes. To detect the collision exactly, an improved algorithm is presented. We set coordinate values of rectangular center and four vertexes and use the distance from a Point to a line to see whether the object's vertexes are enclosed in the other object. if it is true, a collision occurs. Collision detection is part of the handling collision and its result is a Boolean judgment about the collision of two or more objects colliding."

Web link: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6773024`

Full text link: Couldn't find one.

Comments: I found this article on IEEE Xplore. The title says the algorithm presented in the article is an improved one suggesting it must have some figures to prove that it's better than a pre-existing one.

Paper 2

Title: The Design of Collision Detection Algorithm in 2D Grapple Games

Citation: [2]

Abstract: "It is necessary and important to make the collision detection among the objects or between the object and the scene. If we don't detect collisions, objects will intersect each other or object will intersect the scene. In this paper, we present three algorithms in 2D environment. The objects for collision detection are bounded by the axis-aligned rectangles or circles. The known information such as world coordinate system, collision object coordinate system and collision detection area coordinate system etc. are stored in the data files in advance. The data control systems load those information into the collision detection module to handle the collision among the roles and bullets, We set coordinate values of rectangular center and four vertexes and use the distance from a point to a line to see whether the object's vertexes are enclosed in the other object, if it is true, there is a collision occurring. Alg1. is suitable for the situation where the roles get translational movements, Alg2. is suitable for the situation where the role collide the wall, while Alg3. is suitable for the situation where the roles get rotating or flipping movements, which provides the transition for photography coordinates in 3D environment. The three proposed algorithms have less consuming time."

Web link: `http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=5363537`

Full text link: Couldn't find one.

Comments: This article presents three different algorithms so again should have a lot of information, and statistics.

Paper 3

Title: The Construction of a Predictive Collision 2D Game Engine

Citation: [3]

Abstract: "This paper discusses the construction of a game engine which is based around the principle of discrete event simulation. This work is interesting as it uses a predictive time of collision rather than a frame based approach. The key design decisions made and the tools used during the construction of the predictive game engine (PGE) are described. The objects modelled in the game engine are rigid circles and polyhedra which may have an orbit rotational velocity, a positional velocity and acceleration. Equations calculating the time of next collision between two circles, a line and a circle and two lines are given. If orbit rotation is excluded, the two circles expansion is simple as the output from maxima is only twelve lines, conversely when orbit rotation is included the output exceeds 835 lines. The input formula to maxima used for detecting the time of collisions between moving polyhedra are presented alongside a tool to automatically import the expanded formula into program code."

Web link: `http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7004920`

Full text link: `http://floppsie.comp.glam.ac.uk/Papers/paper21/2d-game-engine-mulley.pdf`

Comments: I found this paper on IEEE Xplore, it sounded interesting as it was about predicting the collision but I'm not sure if it will be relevant.

Paper 4

Title: Title of paper

Citation: [?]

Abstract: Copy and paste the abstract here

Web link: Give the URL of the paper in IEEE Xplore, ACM Digital Library, or similar

Full text link: Give the URL of a downloadable PDF of the paper, if you can find one

Comments: Write a few sentences on how you found the article and why you believe it is relevant and/or important.

Paper 5

Title: A recursive algorithm of obstacles clustering for reducing complexity of collision detection in 2D environment

Citation: [4]

Abstract: "In applications of industrial robots, the robot manipulator must traverse a pre-specified Cartesian curve (path) with its hand tip while links of the robot safely move among obstacles. In order to reduce the costs of collision detection, the number of collision checks can be reduced by enclosing a few obstacles (a cluster) with a larger (artificial) bounding volume, e.g. by their convex hull, without cutting the specified curve. In the paper, an efficient and convergent recursive algorithm for refining an initial randomly generated set of clusters is proposed to tackle the problem of clustering convex polygonal obstacles in a 2D robot's scene. Simulation results show that the proposed algorithm acquires less number of clusters and computationally more efficient. In addition, the algorithm can be easily applied to dynamic environment based on the idea of seeds in clusters."

Web link: `http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=933209`

Full text link: `http://www.iis.sinica.edu.tw/papers/liu/15058-F.pdf`

Comments: This paper is may not be as relevant as the others as it is based on collision detection in robots using a 2d scene, however the abstract says that the algorithm presented is trying to reduce the costs of collision detection therefore I think it may be interesting to include in my essay.

References

[1] K. Guo, "An improved algorithm of collision detection in 2d grapple games," *Intelligent Information Technology and Security Informatics*, pp. 328 – 331, 2010.

[2] Y. Tan, "The design of collision detection algorithm in 2d grapple games," *International Conference on Information Engineering and Computer Science, 2009. ICIECS 2009*, pp. 1–4, 2009.

[3] G. Mulley, "The construction of a predictive collision 2d game engine," *8th EUROSIM Congress on Modelling and Simulation*, pp. 68 – 72, 2013.

[4] J. W.-C. L. Chen, Jin-Liang; Liu, "A recursive algorithm of obstacles clustering for reducing complexity of collision detection in 2d environment," *ICRA IEEE International Conference on Robotics and Automation*, vol. 4, pp. 3795 – 3800, 2001.