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Today, we talked about how to detect collisions and how to compute the impulses or contact forces for rigid bodies, including impulse-based method, penalty-based method, and constraint-based method.

These course notes or papers are an excellent introduction for collision detection and the impulse-based method.

- Rick Parent. Compute Animation: Algorithm and Technique, 3rd Edition. Chapter 7.4, September 2012
- Andrew Witkin and David Baraff, Physically Based Modeling: Principles and Practice, Online SIGGRAPH 1997 Course Notes, 1997 https://www.cs.cmu.edu/~baraff/sigcourse/
- James K. Hahn. Realistic animation of rigid bodies. Computer Graphics, Volume 22, Number 4, August 1988
- Brian Vincent Mirtich. Impulse-based Dynamic Simulation of Rigid Body Systems. UC Berkeley PhD thesis, Fall 1996

Penalty-based methods compute the contact forces based on the penetration depth and normal velocity of a pair of objects using linear or nonlinear spring-damper model.

- Rick Parent. Compute Animation: Algorithm and Technique, 3rd Edition. Chapter 7.4, September 2012
- Katsu Yamane and Yoshihiko Nakamura. Stable Penalty-based Model of Frictional Contacts. ICRA 2006
- Hongyi Xu, Yili Zhao, and Jernej Barbič.. Implicit multibody penalty-based distributed contact. IEEE transactions on visualization and computer graphics 20.9 (2014): 1266-1279.

Constraint-based methods compute constraint forces that are designed to exactly cancel any external accelerations that would result in interpenetration. Here are the references if you are interested in more details:

- https://www.toptal.com/game/video-game-physics-part-iii-constrained-rigid-body-simulation
- Michael Bradley Cline, Rigid Body Simulation with Contact and Constraints. UBC Master thesis. 2002
- David Baraff. Non-penetrating Rigid Body Simulation. Eurographics 1993 State of the Art Reports.

A list of interesting recent work is:

- (Impulse-based methods) Jui-Hsien Wang , Rajsekhar Setaluri, Dinesh K. Pai, Doug L. James. Bounce Maps: An Improved Restitution Model for Real-Time Rigid-Body Impact. SIGGRAPH 2017

- (Elastic rods simulation) M. Bergou, M. Wardetzky, S. Robinson, B. Audoly and Eitan Grinspun. SIGGRAPH 2008
- (Constrint-based methods) Mickeal Verschoor and Andrei C. Jalba. Efficient and Accurate Collision Response for Elastically Deformable Models. ACM Transactions on Graphics, Volume 38, Issue 2. March 2019
- (Applying position-based dynamics (PBD) on rigid bodies) Crispin Deul, Patrick Charrier, Jan Bender. Position-Based Rigid Body Dynamics. Computer Animation and Virtual Worlds 2014