SOLVING RIGID MULTIBODY PHYSICS DYNAMICS USING PROXIMAL POINT FUNCTIONS ON THE GPU

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An Abstract of a Thesis Submitted to the Graduate

Faculty of Rensselaer Polytechnic Institute

in Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

Major Subject: COMPUTER SCIENCE

The original of the complete thesis is on file
in the Rensselaer Polytechnic Institute Library

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Troy, New York

July 2011
(For Graduation August 2011)

ABSTRACT

Physical simulation is important for a wide range of problems, particularly so in the field of robotics. The need for faster simulation to provide larger amounts of data is increasingly growing. The trend in computing is growing towards more cores as opposed to faster cores, and the graphical processing unit, or GPU, shows great promise to provide high computational performance. Previously, the dynamics of physical simulation have been solved by using the complementarity formulation. This work explores a different formulation of dynamics using set based force laws, called the proximal point formulation. The formulation of the complementarity based dynamics is reviewed, and this format is used as a base to derive the proximal point formulations, showing equivalence in the process. To test the proximal point's ability to be used in physics simulation, a plugin for dVC2D, a planar physics simulator, is written to implement the proximal point dynamics formulation. In addition, this implementation is also ported to the GPU. The accuracy of these implementations to the complementarity formulation solved with the PATH solver is compared. Finally, the time performance between the implementations and the PATH solver are compared.