1023-34-531 **Tiancheng Ouyang** (`ouyang@math.byu.edu`), 292 TMCB, Department Of Mathematics, Brigham Young University, Provo, UT 84602, and **Zhifu Xie*** (`zxxiex@wm.edu`), Department Of Mathematics, College of William & Mary, Williamsburg, VA 23187. *Regularization of Simultaneous Binary Collisions and Periodic Solutions with Singularity in the Collinear Four-Body Problem.*

Newtonian N-body problem has collision singularity if two of the bodies collide at one time. We construct new coordinates and time transformation that regularize the singularities of simultaneous binary collisions in the collinear four-body problem. The motion in the new coordinates and time scale across simultaneous binary collision at least C^2. Furthermore, we study the behavior of the motion closing, across and after the simultaneous binary collision. Many different types of periodic solutions involving single binary collisions and simultaneous binary collisions are constructed. We write a program to simulate the motion of Newtonian N-body problem. (Received September 16, 2006)