

Dynamics of Jumps and Turns in Alpine Skiing

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To study the performance of jumps or turns in Alpine skiing a detailed understanding of the dynamics of skiers is necessary. We have investigated simple models and checked the results by measurements.

The skiers were modeled as multibody systems by several rigid segments. The equation of motion was established in descriptor form as a DAE. Following Haug, Euler parameters were used in the 3D case. When both holonomic and nonholonomic constraints were considered, an index 2 DAE was obtained by using the velocity level for the geometric constraints. The equation of motion could be established by hand, without using software for multibody systems.

The computed results were compared with experimental data. To this aim, excellent skiers were recorded by video cameras. The coordinates of certain body landmarks were determined by manual digitizing and DLT reconstruction. Partly, the force between the right ski and ski binding was measured, too. The accuracy of the results was satisfactorily.