An Update on the Web-based Library of Computational Benchmark Problems for Multibody Dynamics

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Abstract

An online library of computational multibody benchmark problems was presented by Masoudi et al. [3], along with its potential applications in the field and anticipated benefits to the multibody community. The web-based library was initially developed as a collaboration between the University of Waterloo in Canada, Stanford University in the U.S.A., and the University of La Coruña in Spain. The benchmark library has since been refined and improved, applying feedback from researchers and incorporating principles from well-established references in the field of benchmarking in multibody dynamics [2, 4]. Figure 1 shows a snapshot of the latest version of the web-based benchmark library, which was designed for efficient browsing through a broad collection of multibody problems in a wide variety of engineering applications, and provides tools for contributing new problems and results as well.

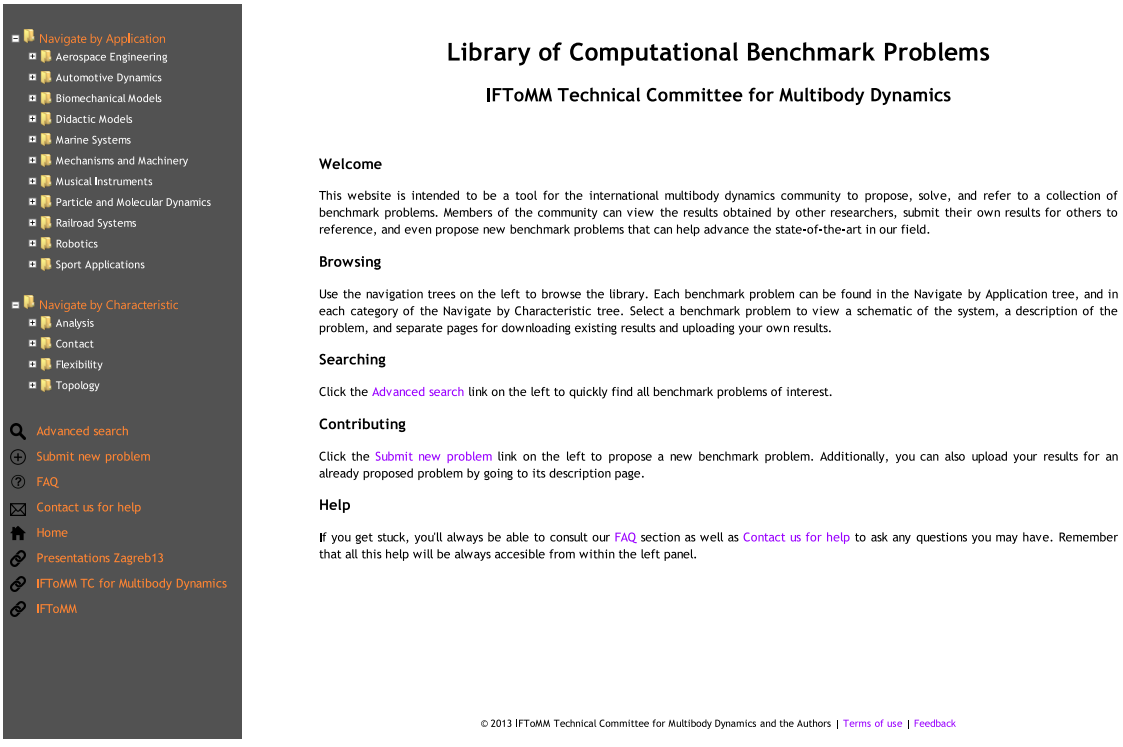

Figure 1: A snapshot of the multibody benchmark library (accessed November 2013).

The final prototype is available at `http://www.iftomm-multibody.org/benchmark/`. The library is searchable, and includes a comprehensive classification scheme for multibody benchmark problems. Each problem is accompanied by a technical information sheet containing all the data needed to construct the multibody system for research, validation, and comparison purposes. Various formulation methods, simulation procedures, computational issues, and related software along with possible evaluation and analysis schemes can be found in several research works [1–4]; these characteristics are included with each problem uploaded to the library.

To maintain a reliable multibody benchmark reference, new problems uploaded to the library should be approved by its curators based on a quick review process. We encourage users to *propose* new problems for the benchmark library by allowing anyone to submit a new problem. Ultimately, *checked benchmark problems* should show a comparison between different methods, formalisms, software, analysis tools, etc. based on clearly identified parameters, initial conditions, and forcing functions.

Several benchmark problems have been proposed for the library (as shown in Figure 2): a double four-bar mechanism and a spatial slider-crank mechanism (rigid, closed-loop systems without contact), and a 2D gait model (a rigid, open-loop mechanism without contact). These examples demonstrate the way that a benchmark problem and its technical information can be published in the library for further investigation by other dynamicists worldwide.

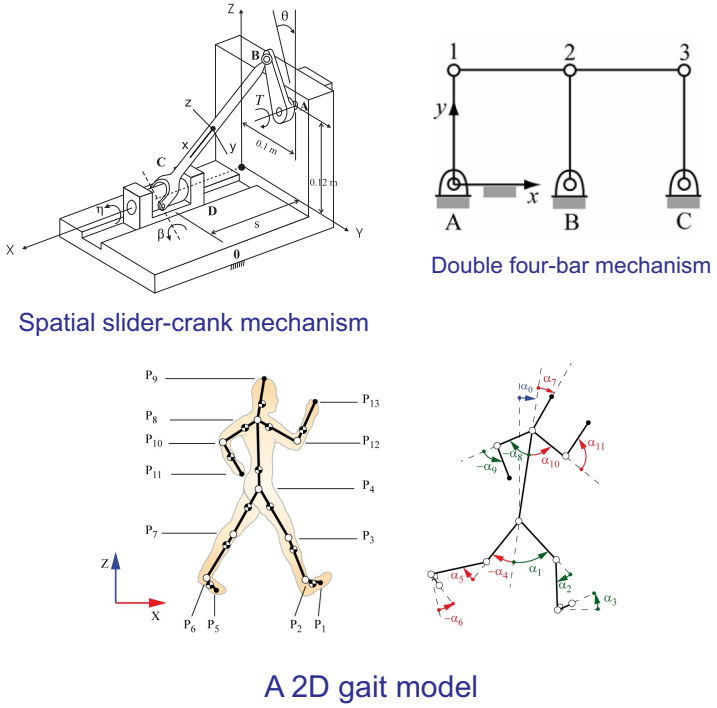

Figure 2: Multibody benchmark problems uploaded to the library (accessed November 2013).

References

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