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Improved GUI of Recursive Dynamics Simulator (ReDySim) for Multibody systems

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Abstract

The ever-increasing demand for faster solutions to the dynamics of complex systems has made multibody dynamics to establish itself in various domains. There has been a lot of advancements in the field of multibody dynamics, mainly owing to the developments in high speed computing. Commercial packages like ADAMS and RecurDyn, though well suited for industrial applications fail to meet the requirements in research areas mainly due to its high price, computational speed, and transparency. Recursive Dynamics Simulator (ReDySim) [1] is one MATLAB-based solver which employs recursive order (n) algorithms to solve the dynamics of multibody systems obtained using the Decoupled Natural Orthogonal Complement (DeNOC) [2,3] approach. The solver's ease of usage at no price will ensure its continuous presence in the scientific community.

The solver allows for customization by the end user in providing DH parameters, mass and inertia properties. The initial version of ReDySim required the user to edit these model parameters by finding the respective MATLAB function file and making the necessary changes to the code. This created a lot of difficulties for the beginners and led to the development of the Graphic User Interface GUI [4]. The GUI greatly simplified the user experience by bringing all the customizable parameters in a single window, thereby enabling ease of access to the existing set of predefined example mechanisms and provision to modify the model parameters easily.

However, since the development of the GUI, various difficulties were encountered by its users which led to some improvements in the GUI. These changes were done, recognizing that the user experience is critical for maximizing its reach in the research community. A screenshot of the updated interface after making the changes is shown in Fig.1. This paper mainly focuses on the modifications made to the GUI since its development. Apart from fixing a few bugs, some new features have also been added to ReDySim GUI as given below:

1. The closed 5 bar mechanism has been added to the already existing set of examples under the 'Fixed-Base Systems' module.

2. Incorporation of a 'Save' option allowing the end user to save the system configuration and any plot (joint angles and rates etc.) which the user might want to save for future reference.

3. Displaying of error message for closed loop examples in Fixed Base module (4 bar, 5 bar, and 3-RRR planar) when it does not conform to one preventing the user from proceeding further until valid link lengths and initial angles are provided which will satisfy the loop closure equation.

4. Inclusion of "Simulation time (Tp)" and "Time step size" fields for every example which made the GUI even more convenient for the user.

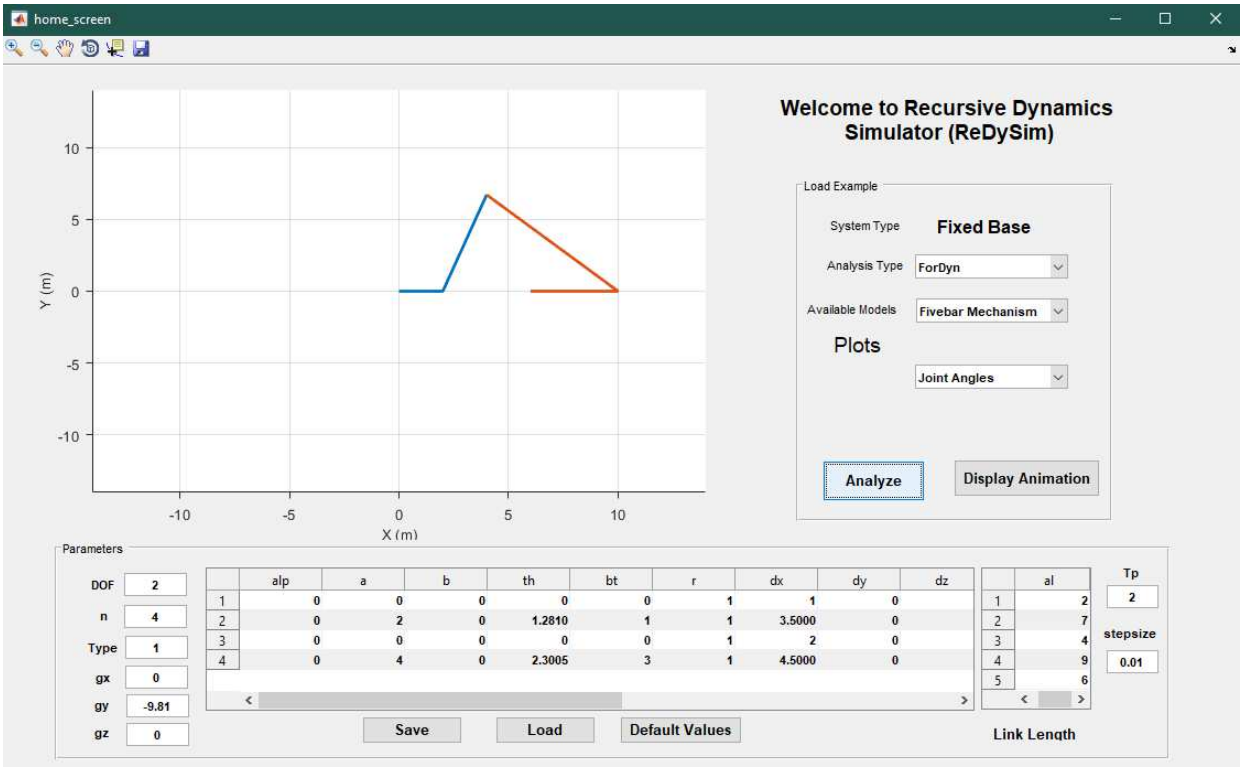

Fig 1. Snapshot of the updated GUI

Apart from the above-mentioned features, few more additions are as follows: instant updating of the link configuration display and DH parameters when the link lengths and angles are modified. These additions improved the functionality and made the software user friendly. Thereby, considering the customizability and efficiency of the ReDySim package the work done to update the GUI is justified.

References

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