Using project-based learning to stimulate creativity in an undergraduate engineering software course
Preetham Burugupally, Isaac Chappell, Bardiya Akhbari, Huazhen Fang, and Caroline Bennett
School of Engineering, University of Kansas

Case study: Dynamics simulation using MSC Adams software

This project marries and evaluates ME 321 Dynamics simulation and ME 320 Dynamics knowledge of the students. The project requires students to work as a team, develop formal reports, and present simulation results and discuss analytical solution in the form of an oral presentation.

Problem statement: Design and construct the best and the most optimum way of modeling a given problem in Adams software. Compare the simulation result with the analytical solution to estimate the error in computational modeling.

Student Learning Activities

1. Identify necessary physics, mechanisms, constraints, etc.
2. Build Adams model of moderate geometry and complexity
3. Test design by performing dynamics simulation with varying time resolution
4. Review results by post-processing the data (tables, plots, and animations)
5. Perform analytical calculations to triangulate simulated results
6. Debug and improve the model by refining
7. Iterate the design to assess the sensitivity by changing computational settings
8. Present study results through report writing and oral presentation

Execution

This project spanned over three weeks that required the services of two teaching assistants who helped with project management and execution.

Primary Challenges

1. Identifying appropriate project:
   - Identify and meet desired learning objectives
   - Adequate level of rigor
   - Create a unique project to foster student creativity
   - Generate a problem pool
   - Promote group work
2. Creating uniform student groups
3. Effective means of evaluating outcomes of the project

Acknowledgements

We gratefully acknowledge the support of Center for Teaching Excellence and the School of Engineering at the University of Kansas