IO2081: Team F H-A-1 Assignment

Be Strong

DE-IO-TUDELFT

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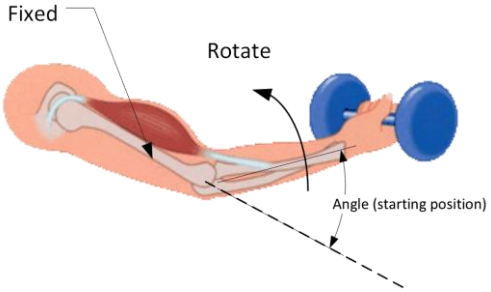
Be strong

CAP Barbell®, one of the leading a leading distributor and provider of fitness equipment, is developing a new set of dumbbells for the European market. In the new set of dumbbells, CAP Barbell® wants to specify the optimal weight and training positions in the manual. For this, they have asked you to help them to explore the relations among the mass of the dumbbells, the maximum angular velocity, torques applied on the elbow joints and the start position (angle) as in the figure. More fundamental understanding is needed, complete with actual (measured) values for angular velocity, acceleration, etc.



Courtesy of www.capbarbell.com

Suggested steps (general)

1. Think – how does it work? (cause – effect);
2. Thought simulation, what parameters do you need to model its operation? Can you find the input via research or measurements?
3. Draft a time-dependent abstract model, either on paper or on Maple®, and list your own assumptions;
4. Set up an experiment to explore the relations;
5. Verify it with theory, your own thoughts and verify it with experiments, this time under different conditions (starting positions);
6. Evaluate it (and advise on the design and the manual).

Setting up your experiment (practical)

For your measurements, the following items are available:

1. Product (a dumbbell);
2. Camera (bring your own or borrow one at the Service Desk);
3. Software Tracker (http://www.cabrillo.edu/~dbrown/tracker/).

Set up your experiment goals, strategy and steps well in advance, since the time and space in the lab is limited.

Hand in:

1. Report – No more than 10 pages, featuring:
    a. A logical order;
    b. Descriptions: each steps in the modeling cycle as applied to your assignment and your actions;
    c. Abstract model with Maple file; specifications in the user manual?
    d. Conclusions & Recommendations.
2. Poster Presentations.