

## Re: equations for inertial simulator

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- *From:* Robert <renenkel@xxxxxxxxxxxx>
  - *Date:* Fri, 22 Feb 2008 20:07:21 -0800 (PST)
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On Feb 22, 8:37 pm, nottoo <nottoo...@xxxxxxxxxxxx> wrote:

Sounds like a very cool idea! Except don't they use electronic controls to drive bells instead of people nowadays?

Sometimes, but perhaps surprisingly there is still quite a lot of interest in human-powered bell ringing, where several ringers each carefully control the period of one bell so as to make them ring in a pre-arranged pattern.

For a real shaft, at some point in time, the total torque applied = I \* angular acceleration. Your applied torque would be the sum of:  
Weight: Some simple trig with theta, m and r.  
Rope:  $Trope = F * r$

I think you'd have to control the speed as well as the torque. For example if the guy lets go, the motor isn't driving any load but it should still rotate with the correct angular acceleration.

Yes, if the rope is released, the motor should simulate the swinging of an inertial pendulum. The complication of the simulator is that you don't really know the force applied by the rope (unless perhaps you could put some kind of strain gauge on it). I was hoping you could make do just by observing the position of the shaft (and deducing the speed) via the encoder, but I'm not sure if this is possible. Even if it is, it may not be possible to make the controller stable. (One quantity I left out of the original formulation of the problem is the rotational inertia of the motor. That might also be important.)

I wonder if it would suffice just to make the motor model the inertial pendulum, ignoring the torque applied by the rope altogether. It should be possible to come up with a differential equation for that. Then the rope just does whatever it does.

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