CS 3451 Report Roll&Slide

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Blue Circle - Rolling

Yellow Circle – Sliding

Red Circle – Old solution

Controls:

Press ‘z’ to deactivate/activate the red circle. Activated by default.

Press ‘m’ to pause or unpause the animation. Paused by default.

Press ‘r’ to restart the animation.

Using the formulas from the website http://physics-animations.com/Physics/English/angl_txt.htm :

Acceleration $a = g \cdot \sin\alpha / (1+I/mR^2)$

The distance is calculated using the formula distance = vt + 1/2at^2. Then we calculate where the ball will be at a very short time later and thus be able to show the animation.

This will give the position for the yellow ball (sliding).

By substituting $I_{ball} = 2mR^2/5 = 0.40 \cdot mR^2$ (solid ball) into the formula $a = g \cdot \sin\alpha / (1+I/mR^2)$, we can see that the acceleration of the blue ball (rolling) is the yellow divided by 1.4. In order to show the ball is rolling, we added a point on the circle that goes in a circular motion with the distance it travelled on the arc of the circle same as the distance travelled by the circle on the path.

The red circle (our solution) is incorrect as we included the centripetal acceleration which should not be there at all. Earlier on, we also attempted to show the velocity and acceleration using vectors to make it like in the real world, but we failed at finding the right balance between the vectors, which caused the inaccuracy in showing the velocity. Also, using vectors was unnecessary. Secondly, we considered the different friction when sliding and rolling, and thought that rolling wouldn’t be possible without a change in the texture of the ground. However, this was not necessary as “**Rolling** is a type of motion that combines rotation (commonly, of an axially symmetric object) and translationof that object with respect to a surface (either one or the other moves), such that, if ideal conditions exist, the two are in contact with each other without sliding.” (from Wikipedia/Rolling)