

Tutorial Problems (18 March 2014)

1. A bug crawls outward along the spoke of a horizontal wheel with speed v' , which is rotating with constant angular velocity $\vec{\omega}$ about a vertical axis. Find all of the apparent forces acting on the bug. (Choose a coordinate system fixed on the wheel, and let the x' axis point along the spoke that the bug is moving along.)
2. In the above problem, calculate how far the bug can crawl before it starts to slip, for a given coefficient of static friction μ_s between the spoke and the bug.
3. A bicycle travels at constant speed V_0 around a circular track of radius ρ . Let b denote the radius of each bicycle wheel. What is the acceleration of the highest point on one of the wheels? (Choose a coordinate system with its origin at the center of the wheel, with the x' axis horizontal and always pointing toward the center of curvature C of the track, and the z' axis always oriented in the vertical direction.)