ro’tate 旋轉、轉動

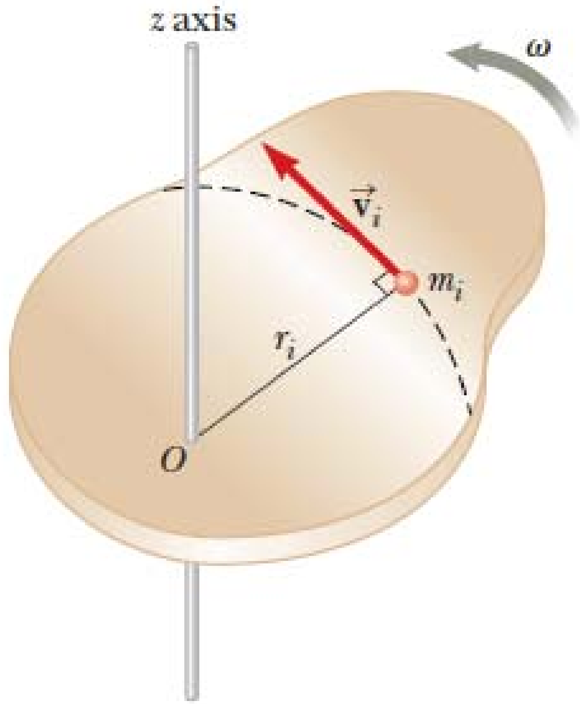
‘angular speed 角速率

‘axis 軸， ro’tation axis 轉軸

tan’gential 切線的，

tan’gential speed 切線速率

ki’netic engergy 動能



Let us consider an object as a system of particles and assume it rotates about a fixed z axis with an angular speed ω. Figure 10.7 shows the rotating object and identifies one particle on the object located at a distance r_i from the rotation axis. If the mass of the ith particle is m_i and its tangential speed is v_i, its kinetic energy is

$$K_i = \frac{1}{2} m_i v_i^2$$

‘rigid 剛硬的、堅固的， rigid body, rigid object 剛體

Indi’vidual 個別的

de’pend on 取決於、依靠

ac’cording to 根據;按照

To proceed further, recall that although every particle in the rigid object has the same angular speed ω, the individual tangential speeds depend on the distance r_i from the axis of rotation according to Equation 10.10. The *total* kinetic energy of the rotating rigid object is the sum of the kinetic energies of the individual particles:

$$K_R = \sum_i K_i = \sum_i \frac{1}{2} m_i v_i^2 = \frac{1}{2} \sum_i m_i r_i^2 \omega^2$$

‘factor 因子、因素， ‘factor out 提出（因子）

‘common to 共有的

i’nertia 慣性、慣量

‘moment of i’nertia 轉動慣量

We can write this expression in the form

$$K_R = \frac{1}{2}\left(\sum_i m_i r_i^{\,2}\right)\omega^2 \quad (10.14)$$

where we have factored ω^2 from the sum because it is common to every particle. We simplify this expression by defining the quantity in parentheses as the **moment of inertia** I of the rigid object:

$$I \equiv \sum_i m_i r_i^{\,2} \quad (10.15)$$

di’mension 因次、量綱、維度

no’tation 符號、標誌

a’nalogy 類比、類似

a’nalogous to 類似的、可比擬的

as’sociated with 使聯合、使結合

trans’lational ‘motion 平移運動

res’pectively 依次地、各自地、逐個地

From the definition of moment of inertia,[2] we see that it has dimensions of ML^2 ($kg \cdot m^2$ in SI units). With this notation, Equation 10.14 becomes

$$K_R = \frac{1}{2} I \omega^2 \tag{10.16}$$

It is important to recognize the analogy between kinetic energy $\frac{1}{2}mv^2$ associated with translational motion and rotational kinetic energy $\frac{1}{2}I\omega^2$. The quantities I and ω in rotational motion are analogous to m and v in translational motion, respectively.