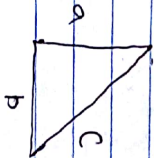


YAKUBU HEERMAT CHUMENI  
 17/ENG02/080  
 COMPUTER ENGINEERING  
 ENGS 281 [ASSIGNMENT]

- The hypotenuse of a right-angled triangle is defined as  $c$ , and its other two sides are denoted as  $a$  &  $b$ . If the possible error of measuring each of  $a$  &  $b$  is  $\pm 1.5\%$ . Find its maximum possible error in calculating
- The area of the triangle
  - The length of the hypotenuse



$$A = \frac{1}{2}ab$$

$$h = \sqrt{a^2 + b^2}$$

$$\textcircled{a} \quad \delta A = \frac{\partial A}{\partial a} \cdot \delta a + \frac{\partial A}{\partial b} \cdot \delta b$$

$$= \frac{b}{2} \cdot \delta a + \frac{a}{2} \cdot \delta b$$

$$\delta b = \frac{\pm 1.5\% \times b}{100} \quad \delta a = \frac{\pm 1.5\% \times a}{100}$$

$$= \frac{\pm 8b}{200} = \frac{\pm 8a}{200}$$

$$= \frac{b}{2} \cdot \frac{\pm 8b}{200} + \frac{a}{2} \cdot \frac{\pm 8a}{200}$$

$$= \frac{3ab}{2} \left[ \frac{\pm 1}{200} + \frac{\pm 1}{200} \right]$$

$$= \frac{3ab}{2} \left[ \frac{1}{100} \right]$$

$$\text{Area} = \frac{ab}{2}$$

$$= 3A \left[ \frac{1}{100} \right] \text{ divide both sides by 3}$$

$$= A \left[ \frac{3}{100} \right]$$

A increases/decreases by 3%

$$b \quad \delta h = \frac{\partial h}{\partial a} \cdot \delta a + \frac{\partial h}{\partial b} \cdot \delta b$$

$$h = (a^2 + b^2)^{\frac{1}{2}}$$

$$u = a^2 + b^2$$

$$h = u^{\frac{1}{2}}$$

$$\frac{\partial h}{\partial a} = \frac{\partial h}{\partial u} \times \frac{\partial u}{\partial a}$$

$$= \frac{1}{2} u^{-\frac{1}{2}} \times 2a$$

$$= \frac{a}{\sqrt{a^2 + b^2}}$$

$$\frac{\partial h}{\partial b} = \frac{\partial h}{\partial u} \times \frac{\partial u}{\partial b}$$

$$= \frac{1}{2} u^{-\frac{1}{2}} \cdot 2b$$

$$= \frac{b}{\sqrt{a^2 + b^2}}$$

$$= \frac{a}{\sqrt{a^2+b^2}} \pm \frac{3a}{200} + \frac{b}{\sqrt{a^2+b^2}} \pm \frac{3b}{200}$$

$$= \frac{a^2}{\sqrt{a^2+b^2}} \pm \frac{3}{200} + \frac{b^2}{\sqrt{a^2+b^2}} \pm \frac{3}{200}$$

$$= \frac{a^2+b^2}{\sqrt{a^2+b^2}} \left[ \pm \frac{3}{100} \right]$$

$$h = \frac{a^2+b^2}{\sqrt{a^2+b^2}}$$

= h increases or decreases by 3%