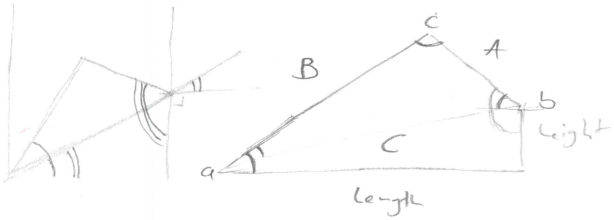
Maintaining Constant Height while changing length



known: (A, B)
measurable: a, C, b (if by) a - angle from line B to floor; b - angle from line a to floor - interior
~~desired~~ target: length, height
need to find: C

Law of Sines & Cosines

known: A, B
measured: a, c, b (possibly)
finding: C

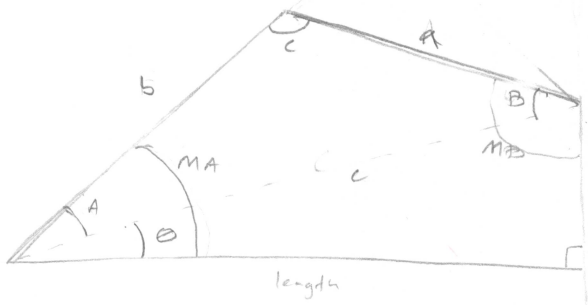
$\frac{\sin A}{Aa} = \frac{\sin C}{Cc}$ ⇒

$C = \sin C \cdot \frac{A}{\sin A}$

finding b

$\frac{\sin A}{Aa} = \frac{\sin B}{Bb}$

$b = \sin^{-1}\left(B \cdot \frac{\sin a}{A}\right)$



length of $C = \sqrt{height^2 + length^2}$ or $C = \frac{height}{\sin\theta}$

or $C = \frac{length}{\cos\theta}$

Target angle $MA = \tan^{-1}\left(\frac{height}{length}\right) + a$.

& Finding Target angles:

MA given target height & length, lengths A & B

$MA = \theta + \alpha A$ $\quad \theta = \tan^{-1}\left(\frac{height}{length}\right)$

$\alpha =$ $\frac{\sin A}{Aa} = \frac{\sin B}{Bb} = \frac{\sin C}{Cc}$

given target height & length, $C = \sqrt{height^2 + length^2}$

finding angle c: ~~SAS~~

$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$

& $C = \cos^{-1}\left(\frac{a^2 + b^2 - (height^2 + length^2)}{2a \cdot b}\right)$

$\cos A = \left(\frac{b^2 + c^2 - a^2}{2bc}\right)$ (b: known; $\sqrt{height^2+length^2}$: known; c: known; 2bc: known; a: found)

$MA = \tan^{-1}\left(\frac{height}{length}\right) + \cos^{-1}\left(\frac{b^2 + height^2 + length^2 - a^2}{2 \cdot b + \sqrt{height^2 + length^2}}\right)$

$MB = \tan^{-1}\left(\frac{length}{height}\right) + \cos^{-1}\left(\frac{height^2 + length^2 + a^2 - b^2}{2 \cdot a \cdot \sqrt{height^2 + length^2}}\right)$

target angle $C = \cos^{-1}\left(\frac{a^2 + b^2 - (height^2 + length^2)}{2 \cdot a \cdot b}\right)$

Now to put this into code.....