Step length adjustment

- Assumption
  - fixed knee joint angle at the ending of swing phase
  - same height for two hip joints

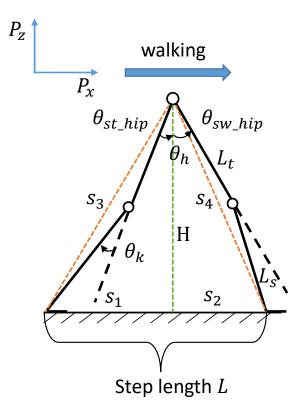- Calculation of hip angle based on step length

$$S_1 + S_2 = L$$
$$S_3^2 - S_1^2 = H^2$$
$$S_4^2 - S_2^2 = H^2$$

$$\Rightarrow \quad S_1 = \frac{L_0^2 + S_3^2 - S_4^2}{2L} \quad S_2 = \frac{L_0^2 + S_4^2 - S_3^2}{2L}$$

$$\theta_{st\_hip} = -\operatorname{asin}\left(\frac{S_1}{S_3}\right) + \operatorname{acos}\left(\frac{L_s^2 - L_t^2 - S_3^2}{-2L_t S_3}\right)$$

$$\theta_{sw\_hip} = \operatorname{asin}\left(\frac{S_2}{S_4}\right) + \operatorname{acos}\left(\frac{L_s^2 - L_t^2 - S_4^2}{-2L_t S_4}\right)$$

- $\theta_{st\_hip}, \theta_{sw\_hip}$: terminal hip angle in the swing phase

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