



$$\circ S_T = T_{a_i}^{-1} T_{a_{i+1}} T_{d_{i+1}} T_{c_i} (d_i)$$

$$\Rightarrow T_{S_T} = T_{a_i}^{-1} T_{a_{i+1}} T_{d_{i+1}} T_{c_i} T_{d_i} T_{c_i}^{-1} T_{d_{i+1}}^{-1} T_{a_{i+1}}^{-1} T_{a_i}$$

Note:

$$Z_0^L = a_0$$

$$T_{Z_0^L} = T_{a_0}$$

$$\circ Z_{i+1}^L = T_{S_T} T_{c_i}^{-1} T_{d_i}^{-1} (Z_i^L)$$

$$\Rightarrow T_{Z_{i+1}^L} = T_{S_T} T_{c_i}^{-1} T_{d_i}^{-1} T_{Z_i^L} T_{d_i} T_{c_i} T_{S_T}^{-1}$$

Note: ~~***~~

$$\Rightarrow \text{Push}(Z_{i+1}) = T_{Z_{i+1}^R} T_{Z_{i+1}^L}^{-1}$$

Push(Z_0)

$$= T_{b_0} T_{a_0}^{-1}$$

$$= T_{b_{i+1}} T_{S_T} T_{c_i}^{-1} T_{d_i}^{-1} T_{Z_i^L}^{-1} T_{d_i} T_{c_i} T_{S_T}$$

↑ This cannot be defined recursively.

$${}^0 y_{i+1}^R = T_{c_i} T_{d_i} T_{d_{i+1}} T_{c_i} (y_i^R)$$

$$\Rightarrow T_{y_{i+1}^R} = T_{c_i} T_{d_i} T_{d_{i+1}} T_{c_i} T_{y_i^R} T_{c_i}^{-1} T_{d_{i+1}}^{-1} T_{d_i}^{-1} T_{c_i}^{-1}$$

$$\Rightarrow \text{Push}(y_{i+1}) = T_{y_{i+1}^R} T_{y_{i+1}^L}^{-1}$$

$$= T_{c_i} T_{d_i} T_{d_{i+1}} T_{c_i} T_{y_i^R} T_{c_i}^{-1} T_{d_{i+1}}^{-1} T_{d_i}^{-1} T_{c_i}^{-1} T_{d_{i+1}}^{-1}$$

Note: $y_0^R = T_{b_0}^{-1} T_{a_0} (d_0)$

$$T_{y_0^R} = T_{b_0}^{-1} T_{a_0} T_{d_0} T_{a_0}^{-1} T_{b_0}$$

$$\text{Push}(y_0) = T_{y_0^R} T_{y_0^L}^{-1}$$

$$= T_{b_0}^{-1} T_{a_0} T_{d_0} T_{a_0}^{-1} T_{b_0} T_{d_0}^{-1}$$

These cannot be
defined
recursively.