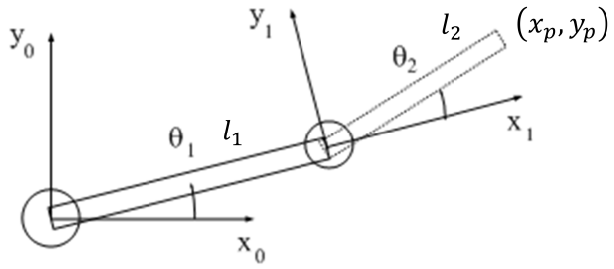
Homework – Jacobians and Bluetooth

1. For the 2-link planar manipulator seen in the figure below (left), show by hand calculations that the manipulator Jacobian is given below (right). (10-points)



$$J_2^0 = \begin{bmatrix} J_v \\ J_\omega \end{bmatrix} = \begin{bmatrix} -l_1 s_1 - l_2 s_{12} & -l_2 s_{12} \\ l_1 c_1 + l_2 c_{12} & l_2 c_{12} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1 & 1 \end{bmatrix}$$

2. Bluetooth Communications: Write NXC programs to detect a Master's button push states as follows. Pushing the Master's left or right arrow buttons sends via Bluetooth, a 1 or 2 respectively. The Slave receives these numbers and displays on its LCD screen the messages "Left" or "Right" respectively.

   a. PDF printout of NXC code (10-points)
   b. URL to YouTube video demonstration (10-points)

3. Serial and Bluetooth Communications: Have the PC serially transmit a number to the Master NXT. The Master NXT then sends this number via Bluetooth, to the Slave NXT. Write NXC code for the Slave such that when the number received is a "1" then the Slave NXT plays a tone. If the number is "0", the tone stops.

   a. PDF printout of NXC code (10-points)
   b. URL to YouTube video demonstration (10-points)