state space model from third order differential equation

$$\dddot{x} = 2\ddot{x} + 3\dot{x} + 4x$$

Define
$$X = \begin{bmatrix} x \\ \dot{x} \\ \ddot{x} \end{bmatrix} \qquad \begin{aligned} x_1 &= x \\ x_2 &= \dot{x} \\ x_3 &= \ddot{x} \end{aligned}$$

$$\dot{X} = \begin{bmatrix} \dot{x} \\ \ddot{x} \\ \dddot{x} \end{bmatrix} = \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix}$$

$$\dot{x}_1 = \dot{x} = x_2$$
$$\dot{x}_2 = \ddot{x} = x_3$$
$$\dot{x}_3 = \dddot{x} = 2\ddot{x} + 3\dot{x} + 4x$$
$$\qquad\qquad = 4x_1 + 3x_2 + 2x_3$$

So we have
$$\dot{x}_1 = 0 x_1 + 1 \cdot x_2 + 0 \cdot x_3$$
$$\dot{x}_2 = 0 x_1 + 0 \cdot x_2 + 1 \cdot x_3$$
$$\dot{x}_3 = 4 x_1 + 3 x_2 + 2 x_3$$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & 3 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$\dot{X} = AX$$

where
$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & 3 & 2 \end{bmatrix}$$