The Bloques Package

Alejandro Garces Ruiz
alejandrogarces@gmail.com

I. Functions

The bloques package is a very simple set of commands based on tikz to generate control blocks. The only packages required in the definition are:

```
\usepackage{tikz}
\usepackage{bloques}
```

The package is very efficient for sequential blocks as follow:

- \bStart{TEXT} a start node without box
- \bGain[mark]{TEXT} a gain with box and a input mark before it
- \bEnd{TEXT} a start node without box
- \bGainPlus{TEXT1}{TEXT2} a gain(TEXT2) and plus mixer with input (TEXT1)
- \bGainMinus{TEXT1}{TEXT2} a gain(TEXT2) and minus mixer with input (TEXT1)
- \bPlus[mark]{NODENAME} a plus mixer with name (NODENAME) and a input mark before it for feed forward
- \bMinus[mark]{NODENAME} a plus mixer with name (NODENAME) and a input mark before it for feed forward
- \bPlusDown{TEXT} a plus mixer with a down input(TEXT)
- \bPlusUp{TEXT} a plus mixer with a up input(TEXT)
- \bMinusDown{TEXT} a minus mixer with a down input(TEXT)
- \bMinusUp{TEXT} a minus mixer with a up input(TEXT)

IF want to start a new sequential blocks use these command:

- \bNewStart{TEXT}{POSITION} a new start node with text(TEXT) at (POSITION)
- \bMarkNode{NODENAME} add a mark node with name NODENAME for the previous node
- \bMarkNodeUp{NODENAME} add a mark node with name NODENAME above ydistance of the previous node
- \bMarkNodeDown{NODENAME} add a mark node with name NODENAME below ydistance of the previous node
- \bInter{TEXT} a no sep-space inter node with text (TEXT1) for feed forward
- \bMarkNodeInter{NODENAME} a no sep-space inter node with name (NODENAME) for feed forward
- \bNewInter{TEXT}{POSITION} a new inter node with text(TEXT) at (POSITION) like new start node but with no sep-space
- \bFeedForward{TEXT}{NODE1}{NODE2} a feed forward with gain (TEXT) from node (NODE1) to node (NODE2)
- \bCrossGain{TEXT}{NODENAME1}{NODENAME2} a cross gain with gain(TEXT) from node (NODENAME1) to node (NODENAME2)
- \bLink{NODENAME1}{NODENAME2} a Line link from node (NODENAME1) to node (NODENAME2)
- \bLinkhv{NODENAME1}{NODENAME2} a H-V Line link from node (NODENAME1) to node (NODENAME2)
- \bLinkvh{NODENAME1}{NODENAME2} a V-H Line link from node (NODENAME1) to node (NODENAME2)

For Feedback controls, it is required to mark the nodes with the following functions:

- \bMinusF[mark]{NODENAME} a minus mixer with name (NODENAME) for feed backward and a input mark before it
- \bPlusF[mark]{NODENAME} a plus mixer with name (NODENAME) for feed backward and a input mark before it
- \bFeedBack{TEXT}{NODENAME} a feed backward with gain(TEXT) to a mixer with name (NODENAME)
- \bFeedBackvhv{TEXT}{NODENAME} a feed backward with gain(TEXT) to a mixer with name (NODENAME) and link line start from the south anchor of the previous node

To change colors and distances, the following functions are available

```
\bShadow{NUMBER}   % default = 0 shadow of node
\bColorB{COLOR}    % default = white, back color of node
\bColorT{COLOR} % default = black, text color of node
\bLineL{Linestyle}  % default is none, more styles like dashed,double can be set
```

```
\bArrow{Arrowstyle} % default is latex, more styles like stealth,Latex,Stealth can be set
\ydistance{Length} % default = 1.2 cm, offset distance of y direction
\restoreydis     % recover to default of the offset distance of y direction
\xdistance{Length} % default = 1.5 cm, offset distance of x direction
\restorexdis  % recover to default of the offset distance of x direction
```

II. examples

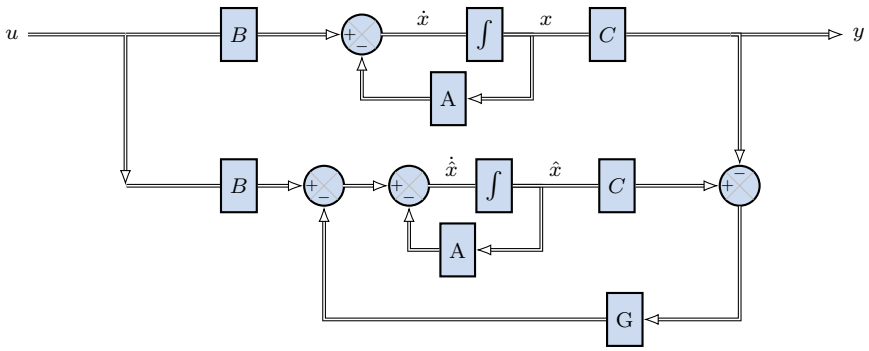
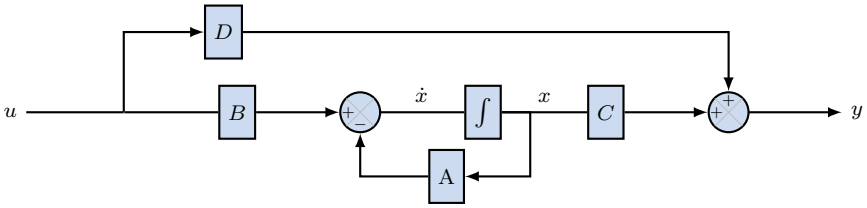
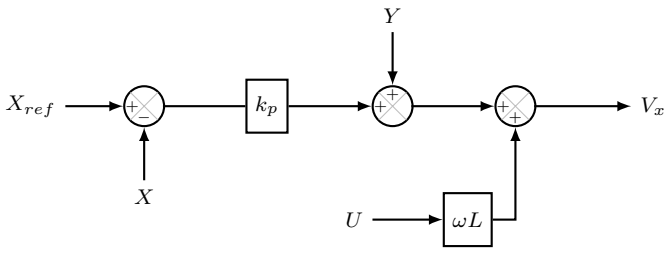


Fig. 1. a state observer of a system



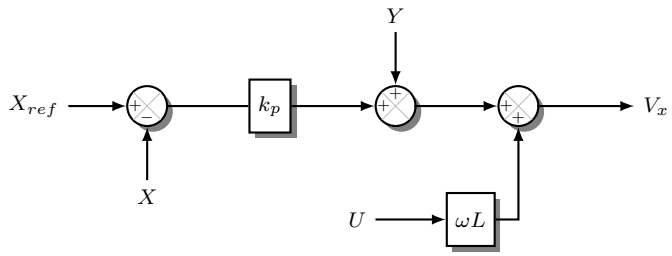

```
\begin{figure}
 \begin{tikzpicture}
        \bColorB{blue!70!green!20}
        \bStart{$u$}
        \bInter{}
        \bMarkNodeInter{NODEU}
        \bGain{$B$}
        \bMinusF{NODEX}
        \bGain[$\dot{x}$]{$\int$}
        \bFeedBack{A}{NODEX}
        \bGain[$x$]{$C$}
        \bPlus{NODEY}
        \bFeedForward{$D$}{NODEU}{NODEY}
        \bEnd{$y$}
 \end{tikzpicture}
\end{figure}
```

Fig. 2. A system state variables diagram



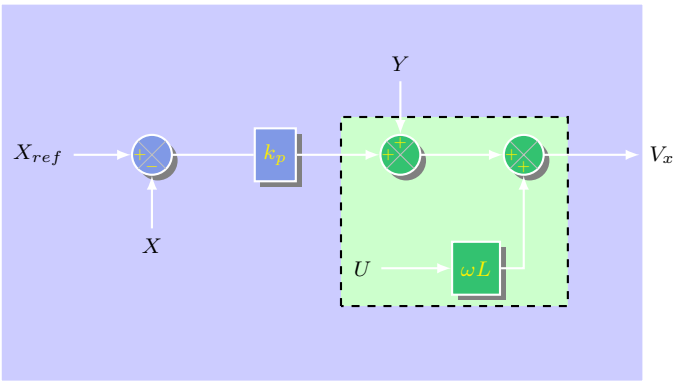

```
\begin{figure}
\begin{tikzpicture}
   \bStart{$X_{ref}$}
   \bMinusDown{$X$}
   \bGain{$k_{p}$}
   \bPlusUp{$Y$}
   \bGainPlus{$U$}{$\omega L$}
   \bEnd{$V_{x}$}
\end{tikzpicture}
\end{figure}
```

Fig. 3. Simple Control diagram



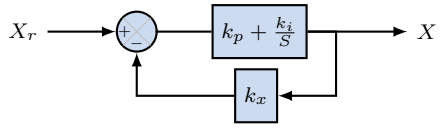

```
\begin{figure}
\begin{tikzpicture}
 \bShadow
    \bStart{$X_{ref}$}
    \bMinusDown{$X$}
    \bGain{$k_{p}$}
    \bPlusUp{$Y$}
    \bGainPlus{$U$}{$\omega L$}
    \bEnd{$V_{x}$}
\end{tikzpicture}
\end{figure}
```

Fig. 4. Control diagram with shadow



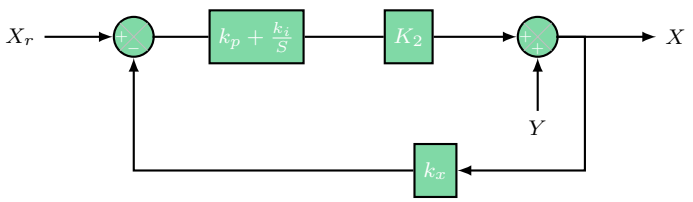

```
\begin{figure}
\begin{tikzpicture}[thick]
\draw[fill=blue!20, draw=white]
     (-0.5,-3) rectangle (8,2);
    \draw[fill=green!20, dashed]
         (4,-2) rectangle (7,0.5);
 \bShadow
 \bColorB{blue!50!green!45}
 \bColorT{yellow}
 \bColorL{white}
    \bStart{$X_{ref}$}
    \bMinusDown{$X$}
    \bGain{$k_{p}$}
 \bColorB{blue!30!green!80}
    \bPlusUp{$Y$}
    \bGainPlus{$U$}{$\omega L$}
    \bEnd{$V_{x}$}
\end{tikzpicture}
\end{figure}
```

Fig. 5. Control diagram with shadow and different colors



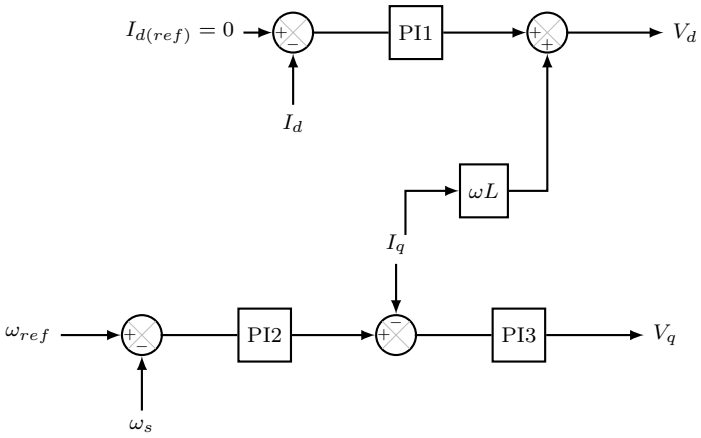

```
\begin{figure}
 \begin{tikzpicture}
    \bColorB{blue!70!green!20}
    \bStart{$X_{r}$}
 \bMinusF{NODEX}
    \bGain{$k_{p}+\frac{k_{i}}{S}$}
 \bFeedBack{$k_{x}$}{NODEX}
    \bEnd{$X$}
 \end{tikzpicture}
\end{figure}
```

Fig. 6. Control diagram with feedback




```
\begin{figure}
 \begin{tikzpicture}
    \bColorB{blue!30!green!50}
    \bColorT{white}
    \bStart{$X_{r}$}
    \bMinusF{NODEX}
    \bGain{$k_{p}+\frac{k_{i}}{S}$}
    \bGain{$K_{2}$}
    \bPlusDown{$Y$}
 \ydistance{2.5cm}
    \bFeedBack{$k_{x}$}{NODEX}
    \bEnd{$X$}
 \end{tikzpicture}
\end{figure}
```

Fig. 7. Change the ydistance




```
\begin{figure}
 \begin{tikzpicture}
 \bStart{$I_{d(ref)}=0$}
    \bMinusDown{$I_{d}$}
    \bGain{PI1}
    \bPlusF{NODET}
    \bEnd{$V_{d}$}
 \bNewStart{$\omega_{ref}$}{(-2,-4)}
    \bMinusDown{$\omega_{s}$}
    \bGain{PI2}
    \bMinusUp{$I_{q}$}
 \bMarkNodeUp{NODEX}
    \bGain{PI3}
    \bEnd{$V_{q}$}
 \bCrossGain{$\omega L$} {NODEX} {NODET}
 \end{tikzpicture}
\end{figure}
```

Fig. 8. More compex controls

III. history

- update on 2021-12-28, by hu zhenzhen (hzzmail@163.com)
  - add new some commands for feed forward drawing
  - add more instructions of cmds in the doc
- v1.0 in 2005, uses TikZ to provide commands for generating control diagrams (specially in power electronics)