The Bloques Package

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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
- \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)
- \bEnd{TEXT} a start node without box
- \bGain[mark]{TEXT} a gain with box and a input mark before it
- \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{NODENAME} a plus mixer with name (NODENAME) for feed forward
- \bInter{TEXT} a inter node with text (TEXT1) for feed forward
- \bMarkNodeInter{NODENAME} a inter node with name (NODENAME) for feed forward
- \bFeedForward{TEXT}{NODE1}{NODE2} a feed forward with gain (TEXT) from node (NODE1) to node (NODE2)

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

- \bMinusF{NODENAME} a minus mixer with name (NODENAME) for feed backward
- \bPlusF{NODENAME} a plus mixer with name (NODENAME) for feed backward
- \bFeedBack{TEXT}{NODENAME} a feed backward with gain(TEXT) to a mixer with name (NODENAME)
- \bCrossGain{TEXT}{NODENAME1}{NODENAME2} a cross gain with gain(TEXT) from node (NODENAME1) to node (NODENAME2)
- \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

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
\ydistance{NUMBER} % default = 1.2 cm offset distance of y direction
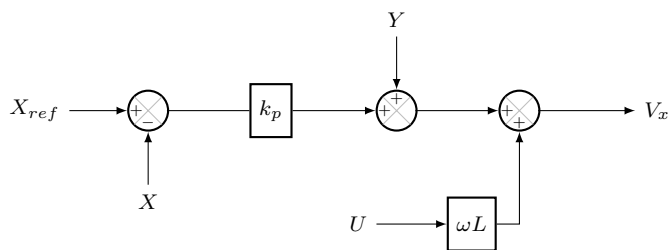
II. examples

Fig. 1. Simple Control 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}
```
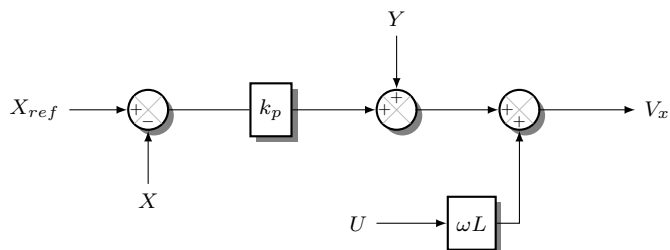

Fig. 2. Control diagram with shadow

```
\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}
```
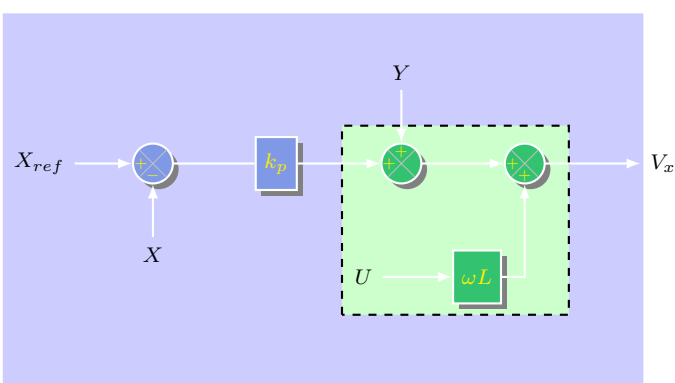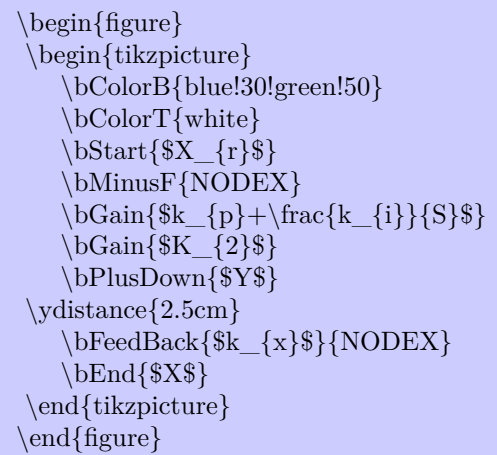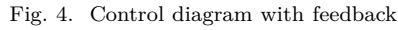

Fig. 3. Control diagram with shadow and different colors

```
\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}
```

```
\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. 4. 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. 5. 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}
```
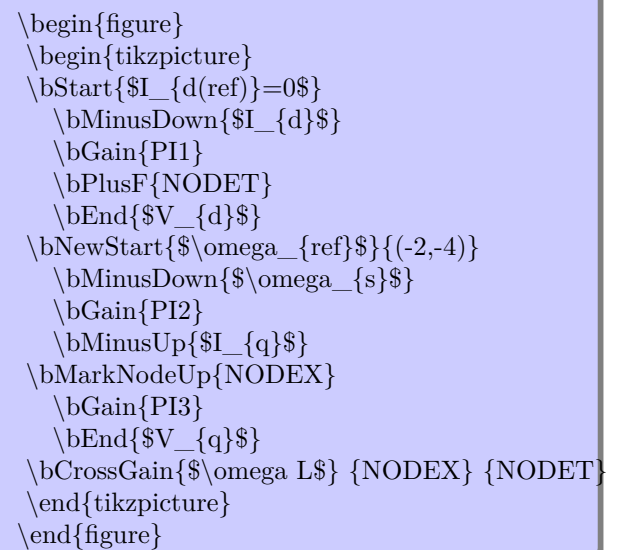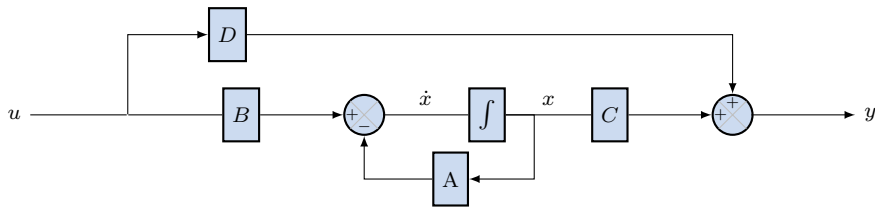
Fig. 6. More compex controls

Fig. 7. A system state variables diagram

```
\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}
```

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)