**kBLOCKS Package**

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I. INTRODUCTION

Welcome to the demo documentation of kBLOCKS. Desiring to typeset control block diagrams in \LaTeX{} and dissatisfied with the other \LaTeX{} macro packages that can be found online, I thought: why not write my own macro package for this purpose.

I wish to start with the question, “What is kBLOCKS?” The kBLOCKS macro package is the product of using TikZ/PGF to directly typeset beautiful control block diagrams and signal flow graphs in my Masters’ dissertation and papers directly with \LaTeX{}. Basically, it just defines a dedicated “kblock” environment and a number of macro commands to make drawing control block diagrams with TikZ/PGF more structured and easier. In a sense, when you use kBLOCKS you program or typeset graphics for control block diagrams, just as you “program” graphics in your document when you use \LaTeX{} using TikZ/PGF.

The powerful options offered by TikZ/PGF often intimidates beginner users not ready to spend careful time learning about TikZ/PGF. Like all \LaTeX{} packages, TikZ/PGF inherits the steep learning curve of \LaTeX{}, that is, no what you see is what you get. The kBLOCKS macro reduces the length of this learning curve, by focusing the graphics theme on control block diagrams only.

Fortunately this documentation as it grows and gets to be improved, will come with a number of demos and proper documentation of the kBLOCKS API, which will guide you on creating control block diagrams with kBLOCKS without your having to read the TikZ/PGF manual.

My wish is that you do find it useful and helpful.

Please, don’t forget to share and star the Github repo: [https://github.com/somefunAgba/kblocks](https://github.com/somefunAgba/kblocks), if you did.

I will readily welcome any issues or emails for improvement or suggestion with respect to using kBLOCKS and making it useful for researchers, students and others involved in the applications and field of control theory and signal processing.
II. Demos

A. Ex:A

\begin{verbatim}
\begin{kblock}
% global ref point 
\kJumpCS{init}
\%% blocks 
\kMarkNodeRight{0.2cm}{0cm}{$r$}{init}{rin}
\kPlusPlusMinus{rin}{sb1}{0.2cm}
\kTFRight{sb1}{tfb1}{$\frac{1}{s}$}
\kMarkNodeRight{0.2cm}{0cm}{}{tfb1}{ny}
\kOutRight{ny}{yout}{$y$}{0cm}
\%% links 
\kLink\{(rin}{sb1}
\kLink\{e\}{sb1}{tfb1}
\kLinkn\{(tfb1}{ny}
\kLinkVHHVBelow{$1$}{ny}{sb1}{0cm}{0cm}{0cm}
\kLinkVHHVAbove{$1$}{ny}{sb1}{0cm}{0cm}{0cm}
\end{kblock}
\end{verbatim}

B. Ex:B

\begin{verbatim}
\begin{kblock}
% global ref point 
\kJumpCS{init}
\%% blocks 
\kMarkNodeRight{0.2cm}{0cm}{$r$}{init}{rin}
\kTFFRDown{rin}{sb1}{0.2cm}
\kTFFR{sb1}{tfb1}{$G(s)$}
\kTFBelow{tfb1}{tfb2}{$H(s)$}
\kMarkNodeRight{0.2cm}{0cm}{}{tfb1}{ny}
\kOutRight{ny}{yout}{$y$}{0cm}
\%% links 
\kLinkVH{$y$}{ny}{tfb2}{0cm}{0cm}{0cm}
\kLinkHV{$\hat{y}$}{tfb2}{sb1}{0cm}{0cm}{0cm}
\kLink\{(rin}{sb1}
\kLink\{e\}{sb1}{tfb1}
\kLinkn\{(tfb1}{ny}
\%% coverings 
\kCoverRect[blue]{sb1}{1cm}{2cm}{0.5cm}{3cm}
\kCoverTextLeft{2cm}{1cm}{covtx}{Closed-loop system};
\end{kblock}
\end{verbatim}
C. Ex:C

\begin{block}
\begin{align*}
V_{dc} & \quad I^\star \\
V_2 & \quad V_3 \\
V_1 & \quad \lambda \\
V_4 & \quad V'_{\text{ref}} \\
K_3 & \\
\end{align*}
\end{block}

D. Ex:D

\begin{block}
\begin{align*}
r & \quad y_m \\
K(y_m, y) & \quad \text{PID controller} \\
P(s) & \quad \text{process} \\
\end{align*}
\end{block}
E. Ex:E

\begin{verbatim}
\begin{block}
% ref
% \kJumpCS(refpt)
% \kJumpCSRight[0cm](refpt){tfb1}{% $\textbf{PID-model}$}
% \kJumpCSBelow[0.25cm]{tfb1}{tfb2}{% $\textbf{PID}$}
% \kTFBelow{tfb1}{tfb2}{% $\mathcal{P}(s)$}
% \kInLeft[0cm]{tfb1}{inR}{$r$}
% \kOutDown[0cm]{tfb1}{outU}{$u_m$}
% \kLink{tfb1}{tfb2}{$y_m$}
% \kLinkHVHRight[0cm]{tfb2}{tfb3}{$u$}
% \kLinkHVHLeft[0.8cm]{tfb3}{tfb2}{$y$}
% \end{block}
\end{verbatim}

F. Ex:F

\begin{verbatim}
\begin{block}
% generic coordinate reference points
% \kJumpCS(0,0){i}
% \kJumpCSRight[-0.5cm]{i}{iR}{3}
% \kJumpCSLeft[-0.5cm]{i}{iL}{9}
% \kJumpCSAbove[-0.5cm]{i}{iA}{12}
% \kJumpCSBelow[-0.5cm]{i}{iB}{6}
% \kTFBelow[0cm]{iB}{tfb1}{% $\mathcal{K}($}
% \kTFBelow[0cm]{tfb1}{tfb2}{% $\mathcal{P}(s)$}
% \kInLeftM[0cm]{tfb1}{inR}{$r$}
% \kMarkNodeLeft{}{tfb2}{ny}
% \kOutLeft[-0.5cm]{ny}{outY}{$y$}
% \kLink{ny}{tfb2}
% \kLinkVH{$y$}{tfb1}{2}
% \kLinkHVHRight[0.6cm]{}{tfb1}{tfb2}{$u$}
% \kCoverRect[magenta!5!red]{tfb2}{0.1cm}{0.1cm}{0.3cm}{0.3cm}
% \kCoverTextBelow{0cm}{txt1}{% physical system (e.g: a dc motor)}
% \kCoverRect[green!75!blue!80!]{tfb1}{0.1cm}{0.1cm}{0.2cm}{0.2cm}
% \kCoverTextAbove{0cm}{txt2}{% computing system (embedded control algorithm)}
% \end{block}
\end{verbatim}
G. Ex:G

Physical System

Computing System

H. Ex:H
I. Ex.I

\[ I = I \]

\[ f_i(\cdot) \]

\[ f_d(\cdot) \]

\[ f_p(\cdot) \]

\[ K_p \]

\[ K_d \]

\[ K_i \]

\[ D = D \]

\[ B = B \]

\[ r \]

\[ e \]

\[ u^* \]

\[ y^* \]

\[ y \]

\[ y_m \]

\[ \omega_n \]

\[ \lambda \]

\[ \text{Description: Closed PID-loop} \]

\[ \text{blocks} \]

\[ \text{links} \]

J. Ex.J

\[ J = J \]

\[ y \]

\[ y_m \]

\[ \omega_n \]

\[ u \]

\[ \lambda \]

\[ K_p \]

\[ K_d \]

\[ K_i \]
% DESCRIPTION: CPLMFC-Algorithm
\begin{block}
% global ref point
% place TF_fts right of global ref.
\kTFRight[4cm]{SRef}{TF_fts}{\kmT{f_{\text{t_s}}}}
\kTFAbove[0.3cm]{TF_fts}{TF_mfc}{\kmT{f_{\text{MFC}}}}
\kTFRight[3cm]{TF_mfc}{TF_pid}{\kmT{f_{\text{PID}}}}
\kTFRight[4cm]{SRef}{TF_fts}{\kmT{f_{\text{t_s}}}}
% place TF_mfc at h cm above TF_fts
% place TF_mfc at h cm above TF_fts
% place TF_mfc at h cm above TF_fts
% extend node-path outwards
% extend node-path outwards
% extend node-path outwards
% link TF_system to N4
% link TF_system to N4
% link TF_system to N4
% VHHV feedback line from N4 to N5
% VHHV feedback line from N4 to N5
% VHHV feedback line from N4 to N5
% arrowless link N5 and N6
% arrowless link N5 and N6
% arrowless link N5 and N6
% link vector links
% link vector links
% link vector links
% cover-sectioning
% cover-sectioning
% cover-sectioning
\end{block}
**L. Ex.L**

\begin{kblock}
\% blks
%TFBelow[0.5cm]{fspt}{plt}{\kmT{P(s)}}
%TFBelow[8cm]{plt}{pidcm}{
\textbf{PID closed-loop model}\n$\dot{x}_m = \mathcal{S}(x_m, r)$
\\% links
% InLeftM[0cm]{plt}{tscalc}{mkws}
% LinkHV[\kmT{\omega_n}]{tscalc}{pidcm}
% InLeftM[0cm]{fis}{tscalc}{mkxts}
% LinkHV[\kmT{x_s}]{tscalc}{fis}
% InLeftM[0.2cm]{pid}{fis}{mkxts}
% LinkHV[\kmT{b,c}]{fis}{pid}
% LinkHV[\kmT{\lambda_d}]{cp}{pid}{mkws}
% Link[\kmT{\lambda_p}]{cp}{pl}
% LinkHV[\kmT{\lambda_i}]{cp}{pl}
% Link[\kmT{u_m}]{pl}{umout}
% Link[\kmT{t_s,t_l}]{pl}{tscalc}
% LinkVH[\kmT{\hat{x}}]{obs}{pid}
% InLeftM[0cm]{obs}{pl}
% Link[\kmT{y}]{obs}{plt}
\end{kblock}
III. \textit{kblocks} API

\textbf{TODO ...}