The keyval package*

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Abstract

A \LaTeX{} package implementing a system allowing the setting of parameters (or 'named arguments' with a \texttt{\langle key\rangle = \langle value\rangle} syntax. Eg: \texttt{\foo[height=3in, shadow = true ]\{bar\}}

This package implements a system of defining and using sets of parameters, which are set using the syntax \texttt{\langle key\rangle = \langle value\rangle}.

For each keyword in such a set, there exists a function which is called whenever the parameter appears in a parameter list. For instance if the set \texttt{dpc} is to have the keyword \texttt{scale} then I would define.

\texttt{\define@key{dpc}{scale}{scale (){\tt\string#1\}}}\texttt{\{\}}

The first argument of \texttt{\define@key} is the set of keywords being used, the second is the keyword, and the third is the function to call. This function will be given as \texttt{#1} the \texttt{\langle value\rangle} specified by the user.

Normally it is an error to omit the \texttt{\langle value\rangle} however if an optional \texttt{\langle value\rangle} is supplied when the keyword is defined, then just the keyword need be supplied.

\texttt{\define@key{dpc}{clip}{true}{}\{\}}

For \texttt{\langle clip\rangle} you can go \texttt{\langle clip = true\rangle} or \texttt{\langle clip = false\rangle} or just \texttt{\langle clip\rangle}, which is the same as \texttt{\langle clip = true\rangle}.

To use these keywords, just call \texttt{\setkeys} with a comma separated list of settings, each of the form \texttt{\langle key\rangle = \langle value\rangle}, or just \texttt{\langle key\rangle}. Any white space around the \texttt{\langle=\rangle} and \texttt{\langle,\rangle} is ignored.

As the \texttt{\langle key\rangle} is passed as a macro argument, if it consists entirely of a \texttt{\{ \}} group, the outer braces are stripped off. Thus \texttt{\langle key=foo\rangle} and \texttt{\langle key={foo}\rangle} are equivalent. This fact enables one to ‘hide’ any commas or equals signs that must appear in the value. i.e. in \texttt{\foo=(1,2,3),bar=4}, \texttt{\foo} gets the value \texttt{1,2,3}, the comma after \texttt{1} does not terminate the keyval pair, as it is ‘hidden’ by the braces.

Empty entries, with nothing between the commas, are silently ignored. This means that it is not an error to have a comma after the last term, or before the first.

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1 Example

We may extend the examples above to give a ‘fake’ graphics inclusion macro, with a syntax similar to that used in the psfig macros.

\dpcgraphics has one optional argument which is passed through \setkeys, and one mandatory argument, the filename. It actually just typesets its arguments, for demonstration.

The declared keys are: scale, height, width, bb, and clip. Except for the last, they must all be given a value if used.

Note how in the following, any white space around = or , is ignored, as are the ‘empty’ arguments caused by extra commas. Note also that each macro receives exactly the tokens that you specify as arguments, no premature expansion is done.

\def\dpcgraphics{
@ifnextchar\[
@dpcgraphics[
\def@dpcgraphics[#1]#2{{\setkeys{dpc}{#1}INPUT: #2}}
\define@key{dpc}{scale}{scale ({\tt\string#1\relax})\}
\define@key{dpc}{clip}{clip ({\tt\string#1\relax})\}
\def\scalemacro{9}
\dpcgraphics
[ height =4in, ,
width = 3in, ,
scale = \scalemacro, 
bb = 20 20 300 400 ,
clip, 
]{aaa}
height (4in)
width (3in)
scale (\scalemacro)
bounding box (20 20 300 400)
clip (true)
 INPUT: aaa

2 The Internal Interface

A declaration of the form:
\define@key{family}{key}{...}
Defines a macro \KV@prefix@key with one argument. When used in a keyval list, the macro receives the value as its argument.

A declaration of the form:
\define@key{family}{key}[default]{...}
Defines a macro \KV@family@key as above, however it also defines the macro \KV@family@key/default as a macro with no arguments, and definition \KV@family@key/default.

Thus if macros are defined using \define@key, the use of a key with no value ... ,foo,... is always equivalent to the use of the key with some value, ... ,foo=default,... However a package writer may wish that the ‘default’ behaviour for some key is not directly equivalent to using that key with a value. (In particular, as pointed out to me by Timothy Van Zandt, you may wish to omit error checking on the default value as you know it is correct.) In these cases one simply needs to define the two macros \KV@(family)@key and \KV@(family)@key/default directly using \def (or \newcommand). I do not supply a user interface for this type of definition, but it is supported in the sense that I will try to ensure that any future upgrades of this package do not break styles making use of these ‘low level’ definitions.
3 The Macros

From version 1.05, all ‘internal’ macros associated to keys have names of the form: \KV@⟨family⟩@⟨key⟩ or \KV@⟨family⟩@⟨key⟩@⟨default⟩

1 (*package)
\setkeys The top level macro. #2 should be a comma separated values of the form ⟨key⟩ = ⟨value⟩ or just simply ⟨key⟩. The macro associated with this key in the ‘family’ #1 is called with argument ⟨value⟩. The second form is only allowed if the key was declared with a default value.

2 \long\def\setkeys#1#2{% 
Save the ‘family’ for later. Then begin acting on the comma separated list.
3 \def\KV@prefix{KV@#1@}%
4 \let\@tempc\relax
5 \KV@do#2,\relax,}

\KV@do Iterate down the list of comma separated argument pairs.

6 \long\def\KV@do#1,{% 
7 \ifx\relax#1\@empty\else
8 \KV@split#1==\relax
9 \expandafter\KV@do\fi}

\KV@split Split up the keyword and value, and call the appropriate command. This macro was slightly reorganised for version 1.04, after some suggestions from Timothy Van Zandt.

10 \long\def\KV@split#1=#2=#3\relax{% 
11 \KV@@sp@def\@tempa{#1}%
12 \ifx\@tempa\@empty\else
13 \expandafter\let\expandafter\@tempc
14 \csname\KV@prefix\@tempa\endcsname
15 \ifx\@tempc\relax
16 ⟨plain⟩ \KV@err
17 ⟨plain⟩ \KV@errex
18 {⟨@tempa space undefined⟩}%
19 \else
20 \expandafter\expandafter\KV@@sp@def\@tempb{#2}%
21 \KV@default
22 \else
23 \KV@split\@tempb{#2}%
24 \expandafter\expandafter\expandafter\KV@default\@tempb{#2}%
25 \expandafter\expandafter\expandafter\KV@default\@tempb{#2}%
26 \fi
27 \fi}

\KV@default Run the default code, or raise an error.

28 \def\KV@default{% 
29 \expandafter\expandafter\KV@default\@tempb{#2}%
30 \csname\KV@prefix\@tempa @default\endcsname
31 \ifx\@tempb\relax
32 \KV@err{No value specified for \@tempa}%
33 \else
34 \@tempb\relax
35 \fi}
\KV@err Error messages.

36 ⟨plain⟩\def\KV@err#1{\errmessage{key-val: #1}}
37 ⟨*plain⟩\DeclareOption{unknownkeysallowed}{%\def\KV@err#1{\errmessage{key-val: #1}}}
38 \DeclareOption{unknownkeyserror}{%\def\KV@err#1{\PackageError{keyval}{#1}\@ehc}}
39 \ExecuteOptions{unknownkeyserror}
40 \let\KV@err\KV@errx
41 \ProcessOptions

\KV@@sp@def \KV@@sp@def\langle cmd\rangle\langle token list\rangle is like \def, except that a space token at the beginning or end of \langle token list\rangle is removed before making the assignment. \langle token list\rangle may not contain the token \@nil, unless it is within a brace group. The names of these commands were changed at version 1.05 to ensure that they do not clash with 'internal' macros in a key family 'sp'.

Since v1.10, # may appear in the second argument without it needing to be doubled as ##. Also earlier versions would drop any initial brace group, so \{abcd\}d would incorrectly be treated as abcd. The current version only removes brace groups that surround the entire value, so \{abcd\} is treated correctly as abcd. Prior to v1.14, two levels of bracing are removed, if you require the entire argument to be a single brace group, you had use \{\{abcd\}\}, from v1.14 exactly one brace group is removed, so to make the entire value be a brace group you need \{\{abc\}\}.

46 \def\@tempa{}%47 \long\def\KV@@sp@def##1##2{%48 \futurelet\KV@tempa\KV@@sp@d##2\@nil\@nil\@nil\relax##1}%
50 \long\def\KV@@sp@d{\ifx\KV@tempa\@sptoken\expandafter\KV@@sp@b\else\expandafter\KV@@sp@d\expandafter\@nil\fi}%
55 \long\def\KV@@sp@c\@nil\@nil\relax\KV@toks@{#1}\edef#3{\the\KV@toks@}%56 ⟨plain⟩\def\@sptoken{#1}%
58 \KV@toks@ Macro register used above to prevent # doubling. Avoid using one of the normal scratch registers, as this code is not in a local group.
60 \neutoks\KV@toks@
\define@key Define the command associated to the key \texttt{#2} in the family \texttt{#1}. First looks for a default argument (the default value for the key)
\begin{verbatim}
def\define@key#1#2{\@ifnextchar[{{\KV@def{#1}{#2}}}{\long\@namedef{KV@#1@#2}####1}}
\end{verbatim}

\KV@def Make the definitions of the command, and the default value.
\begin{verbatim}
def\KV@def#1#2[#3]{\long\@namedef{KV@#1@#2@default\expandafter}{\csname KV@#1@#2\endcsname{#3}}\expandafter\long\@namedef{KV@#1@#2}##1}
\end{verbatim}

(/package)