Solutions to the riddle from TUGboat 11#4

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Puzzle:
Given a simple \TeX{} document containing only straight text, is it possible for the editor, after deleting one sentence, to end up with a document producing an extra page?

We assume that the deleted text contains no \TeX{} macros and that the document was prepared with a standard macro package like the one used for TUGboat production.

When I wrote down the riddle, I had a real life experience with the TUGboat layout in mind. In \texttt{ltugboat.sty} we have

\begin{verbatim}
\widowpenalty=10000
\clubpenalty =10000
\end{verbatim}

Suppose that a four line paragraph is broken across two pages. If we now reduce this paragraph to three lines, then \TeX{} will no longer find any breakpoint in this paragraph.\footnote{Before, there was a permissible breakpoint between the second and the third line.} So it will move the whole paragraph to the next page, thereby enlarging the document by at least one line. Similar problems might arise before displayed formulas if the default value for \texttt{predisplaypenalty} is used.

Three other solutions were communicated to me by Bogoslaw Jackowski and Marek Ryčko. They all might occur in situations where only one word is removed from the input.

- \texttt{linskip} might get inserted when a paragraph is reformatted after deletions. If this parameter is positive\footnote{The default in \LaTeX{} is 1pt.} it will enlarge the paragraph height.

- If, after deletions, a footnote marker would have to be placed on the last line of a page, \TeX{} will move the whole line to the next page.

- If the value of \texttt{beforedisplayskip} is smaller than \texttt{beforedisplayshortskip} removal of words preceding a formula might enlarge the document.

While the last solution might be classified under “obscure layouts”, all solutions show that parameter setting in \TeX{} is a difficult art and might result in surprising results. There are many parameter settings buried inside plain \TeX{} that have never been questioned. It would be nice if this short example arouses enough curiosity in you to play with them.\footnote{You probably won’t believe this, but when I entered a few corrections to this note (as suggested by Chris Rowley), the current paragraph became a bit shorter, so that the word “them” moved up one line. Now, \texttt{ltugboat.sty} sets \texttt{widowpenalty} to 10000, so that the column break could not be taken at the same place as before. Therefore one line from the preceding column was moved to this one.}

One learns by experience — most of \TeX{}’s world is still unexplored.\footnote{An interesting and wide open field is the paragraph breaking mechanism, especially with the new \texttt{emergencystretch} feature. Don Knuth has given us some hints about its potential but this has been never been systematically researched (or at least such research has never been published), which is a pity.}