

Using LuaT_EX the hard way

How to use the internal
node structure of LuaT_EX
to create a PDF document
without using
`\backslashes`

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What I like about T_EX

The Book of Tea

in others. The average Westerner, in his sleek complacency, will see in the tea ceremony but another instance of the thousand and one oddities which constitute the quaintness and childishness of the East to him. He was wont to regard Japan as barbarous while she indulged in the gentle arts of peace: he calls her civilised since she began to commit wholesale slaughter on Manchurian battlefields. Much comment has been given lately to the Code of the Samurai,—the Art of Death which makes our soldiers exult in self-sacrifice; but scarcely any attention has been drawn to Teaism, which represents so much of our Art of Life. Fain would we remain barbarians, if our claim to civilisation were to be based on the gruesome glory of war. Fain would we await the time when due respect shall be paid to our art and ideals.

When will the West understand, or try to understand, the East? We Asiatics are often appalled by the curious web of facts and fancies which has been woven concerning us. We are pictured as living on the perfume of the lotus, if not on mice and cockroaches. It is either impotent fanaticism or else abject voluptuousness. Indian spirituality has been derided as ignorance, Chinese sobriety as stupidity, Japanese patriotism as the result of fatalism. It has been said that we are less sensible to pain and wounds on account of the callousness of our nervous organisation!

Why not amuse yourselves at our expense? Asia returns the compliment. There would be further food for merriment if you were to know all that we have imagined and written about you. All the glamour of the perspective is there, all the unconscious homage of wonder, all the silent resentment of the new and undefined. You have been loaded with

What I like about T_EX

Vorwort

Wie sonderbar, dass ich, der ich die Welt beherrsche, mit 32 Schachfiguren nicht fertig werde.



HARUN AL-RASCHID (763–809),
abbasidischer Kalif

M BINE Liebesbeziehung mit der Französischen Verteidigung begann im Jahre 1988: In den vorangegangenen Jahren hatte ich als Weißspieler gegen Französisch stets mit großen Problemen zu kämpfen gehabt, nun wollte ich mir als Schwarzer von meinen künftigen Gegnern die rechte Vorgehensweise zeigen lassen ... Obwohl Französischadepten in der Anfangsphase zumeist etwas Lehrgeld zahlen müssen, lächelte mir die holde Französin von Anfang an zu: Auf der Jagd nach meiner zweiten und dritten Großmeisternorm gelangen mir auf Anhieb in Lugano und Dortmund 1988 zwei wichtige Schwarzsiege gegen die starken Großmeister MARK HEBDEN und PETAR POPOVIC. Auch für Französisch-Connaisseur LEV PSAKHIS hat »Die Französin« offenbar weiblichen Charakter, im

What I like about T_EX

11. ... e5!

Tabelle 8

| § | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | |
|---|--------------|------------------------|-------------------------|---------------------------------------|---------------------------|--------------------------|--------------------------|--------------------------|------------|---|---|
| 1 | ♔g3?! ♚f3 | gf3 ¹ c4 | ♙e2 ² ed4 | o-o? ³ ♙f5 ⁴ | ♚fe1 ⁵ dc3 | ♙f1 ⁶ ♚d7 | ♙e7 ♚e7 | ♔e5 ♚c6 | ♔c3 b5 | | + |
| 2 | ... | ... | ... | ♙f6! ♔f8 | ♙d4 ♚f5 | ♔g5 ⁷ ♚fd4 | cd4 ♙f5 | c3 ♚e8 | ♚a2 ♚e6 | h4 ⁸ | ∞ |
| 3 | ... | ... | ... | ♙d2 ♚f5 | ♔g5 ed4! ⁹ | cd4 c3 | ♙e3 ♚cd4 | ♙d4 ¹⁰ ♚d4 | ♚g1 g6 | ♔e5 ♔c5! ¹¹ | + |
| 4 | ♔h4 e4 | ♙f6 gf6 | ♔f6 ♔f8!? | ♔f8 ¹² ♚f8 | dc5! ¹³ ef3 | gf3 ♙f5 | ♚b1 b6 ¹⁴ | ♙f5 ♚f5 | cb6 ab6 | ♚b6 ♚fe7 | = |
| 5 | ... | ... | ... | cd3 ¹⁵ ♙f5!? | o-o ♙d3 ¹⁶ | ♚fe1 ♚g6 | ♔e6 ♚g7 ¹⁷ | dc5 | | | ∞ |
| 6 | ... | ... | ... | ... | ♚d4 ¹⁸ ♚d4 | ♔d4 ♙f5 | o-o ♚c6 | ♔e3 ¹⁹ d4 | cd4 ♔d4 | ♚fd1 ²⁰ ♚d8 ²¹ | ∞ |
| 7 | ... | ... | ... | ... | ... | ... | ♔e3 ²² d4 | cd4 ²³ ♙f5 | o-o ♔d4 | | ∞ |

12. ♙h7 ♚h7 ➡ Tab. 9, S. 250.

What I don't like about T_EX

```
\cs_new_protected:Npn \__xparse_declare_cmd_mixed_aux:Nn #1#2
{
  \__xparse_flush_m_args:
  \cs_generate_from_arg_count:cNnn
    { \l__xparse_function_tl \c_space_tl code }
  \cs_set_protected:Npn \l__xparse_current_arg_int {#2}
  \cs_set_protected_nopar:Npx #1
  {
    \int_zero:N \l__xparse_processor_int
    \tl_set:Nn \exp_not:N \l__xparse_args_tl
      { \exp_not:c { \l__xparse_function_tl \c_space_tl code } }
    \tl_set:Nn \exp_not:N \l__xparse_fn_tl
      { \exp_not:c { \l__xparse_function_tl \c_space_tl } }
    \exp_not:o \l__xparse_signature_tl
    \exp_not:N \l__xparse_args_tl
  }
}
```

self explaining, of course

What I don't like about T_EX

```
\let~\catcode~`76~`A13~`F1~`j00~`P2jdefA71F~`7113jdefPALLF
PA' 'FwPA;;FPAZZFLaLPA//71F71iPAHHFLPAzzFenPASSFthP;A$$FevP
A@@FfPARR717273F737271P;ADDFRgniPAW71FPATTFvePA**FstRsamP
AGGFRruoPAqq71.72.F717271PAY7172F727171PA??Fi*LmPA&&71jfi
Fjfi71PAVVFjbigskipRPWGAUU71727374 75,76Fjpar71727375Djifx
:76jelse&U76jfiPLAKK7172F71l7271PAXX71FVLn0SeL71SLRyadR@oL
RrhC?yLRurtKFeLPFovPgaTLtReRomL;PABB71 72,73:Fjif.73.jelse
B73:jfiXF71PU71 72,73:PWs;AMM71F71diPAJJFRdriPAQQFRsreLPAI
I71Fo71dPA!!FRgiePBt'el@ lTLqdrYmu.Q.,Ke;vz vzLqipip.Q.,tz;
;Lql.IrsZ.eap,qn.i. i.eLlMaesLdRcna,;!;h htLqm.MRasZ.il,%
s$;z zLqs'.ansZ.Ymi,/sx ;LYegseZRyaI,@i;@ TLRlogdLrDsW,@;G
LcYlaDLbJsW,SWXJW ree @rzchLhzsW,;WERcesInW qt.'oL.Rtrul;e
doTsW,Wk;Rri@stW aHAHHFndZPpqar.tridgeLinZpe.LtYer.W,:jbye
```

(sorry, David)

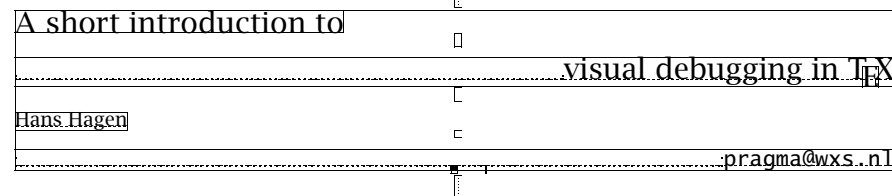
My Conclusion (I)

I like to use T_EX,
but I am afraid of programming it



First answer

Let me give you



This kind of fancy heading shows some dotted lines, rules and peculiar visual symbols. A more close observation learns that in fact it is some endoscopic view in what is often called T_EX's stomach. For those readers who have planned to skip the rest of this article, here is how the magic is done:

```
\input supp-vis \showmakeup
```

For those who want to take a closer look at all those kerns, skips and penalties, this articles can be of some help. Although this kind of stuff often attracts the more hacking type of reader, the module described here can be of great help and provide a lot of fun to all T_EX users, whatever macropackage they use.

When T_EX builds paragraphs and pages, it takes a lot into account. Even after years of writing macros the interference of skips, kerns, penalties, boxes and rules sometimes surprises me. One must always be aware of interline skips, top of page skips, good breaks and no breaks, either user supplied or system generated.

The idea to build some visualization macros was born while I was documenting the source of CON_T_E_XT. Because this package is quite complete, the full documentation will be laid down in thousands of pages. Such technical documentation cannot go without showing how things are done. Because most macros at the user level have some visual impact, I decided to build a visualization tool. After having written this bunch of macros, their second purpose soon became visual debugging.

The concept is rather simple: replace the primitives `\.box`, `\.skip`, `\kern`, `\penalty`, `\.glue`, `\.ss`, `\.fil`, and `\.fil.neg` by macros that makes them visible. Most advanced T_EX tutorials give examples of adapting the primitive `\par`, but somehow tampering with other T_EX primitives is considered more tricky. Although the name primitive suggest that they are somehow fixed, even primitives can be `\let'd` or `\def'd` to something

art-visi.pdf (Hans Hagen)

Second answer



Idea

1 A short story

A wonderful serenity has taken possession of my entire soul, like these sweet mornings of spring which I enjoy with my whole heart. I am alone, and feel the charm of existence in this spot, which was created for the bliss of souls like mine. I am so happy, my dear friend, so absorbed in the exquisite sense of mere tranquil existence, that I neglect my talents.

- one
- two
- three

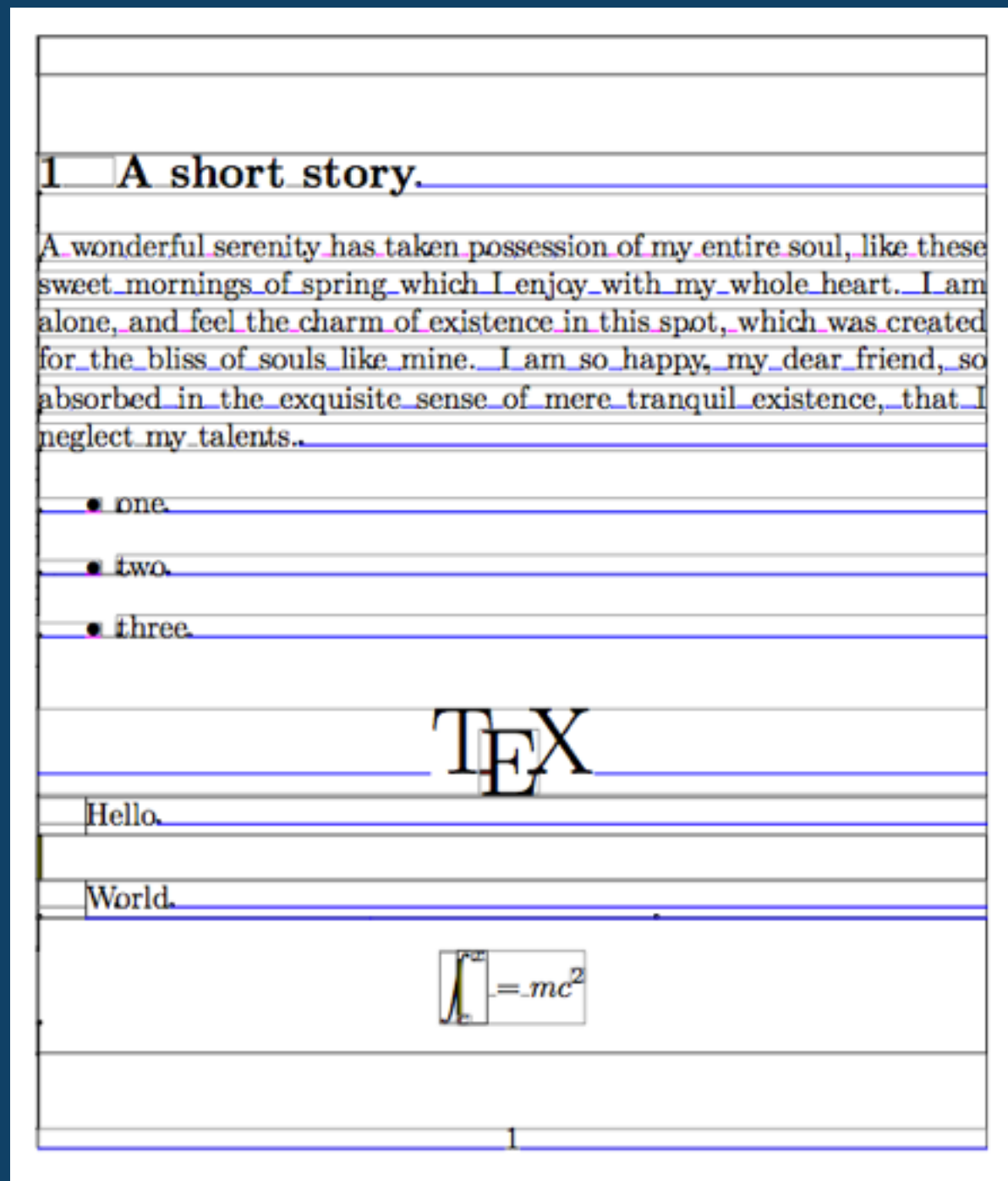
T_EX

Hello

World

$$\int_e^x = mc^2$$

Idea



Detail



How its done

Source

```
\documentclass{article}
\begin{document}
\section{A short story}
```

A wonderful serenity has taken possession of my entire soul, like these sweet mornings of spring which I enjoy with my whole heart. I am alone, and feel the charm of existence in this spot, which was created for the bliss of souls like mine. I am so happy, my dear friend, so absorbed in the exquisite sense of mere tranquil existence, that I neglect my talents.

```
\begin{itemize}
\item one
\item two
\item three
\end{itemize}
```

```
\bgroup\fontsize{30}{34}\selectfont
\centerline{\TeX}
\egroup
```

```
\vbox{\strut Hello}\kern .5cm\vbox{\strut World}
```

TeX



PDF

1 A short story

A wonderful serenity has taken possession of my entire soul, like these sweet mornings of spring which I enjoy with my whole heart. I am alone, and feel the charm of existence in this spot, which was created for the bliss of souls like mine. I am so happy, my dear friend, so absorbed in the exquisite sense of mere tranquil existence, that I neglect my talents.

Intermediate format

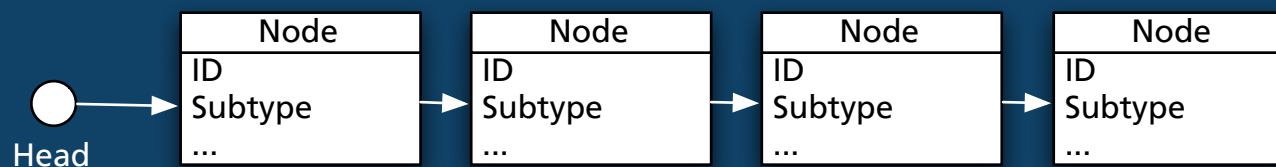
TeX

$$\int_e^x = mc^2$$

1

Intermediate format

- Data structure: lists of nodes



- Example: glyph node (letter “H”)

| Node | |
|---------|-----|
| ID | 37 |
| subtype | 0 |
| next | ... |
| char | 72 |
| font | 0 |
| lang | 1 |
| ... | ... |

Glyph node “H”

```
n = node.new("glyph")
n.char = 72
n.font = 0
n.lang = 1
```

Intermediate format

A wonderful serenity has taken possession of
my entire soul, like these sweet mornings of spring
which I enjoy with my whole heart. I am alone,
and feel the charm of existence in this spot, which
was created for the bliss of souls like mine.

| vlist | |
|--------|-----------|
| width | ... |
| height | ... |
| depth | ... |
| list | (pointer) |



| hlist | |
|--------|-----------|
| width | ... |
| height | ... |
| depth | ... |
| next | (pointer) |
| list | (pointer) |



| hlist | |
|--------|-----------|
| width | ... |
| height | ... |
| depth | ... |
| next | (pointer) |
| list | (pointer) |



| hlist | |
|--------|-----------|
| width | ... |
| height | ... |
| depth | ... |
| next | (pointer) |
| list | (pointer) |



Detail



Detail



PDF

1 0 0 RG 0 0 10 5 re s

Detail



PDF

```
1 0 0 RG 0 0 10 5 re s
red
```

Detail



PDF

1 0 0 RG 0 0 10 5 re s
 red rectangle

PDF instructions

| pdf_literal | |
|-------------|------------------------|
| data | 1 0 0 RG 0 0 10 5 re s |
| mode | 0 |
| next | (pointer) |
| prev | (pointer) |

```

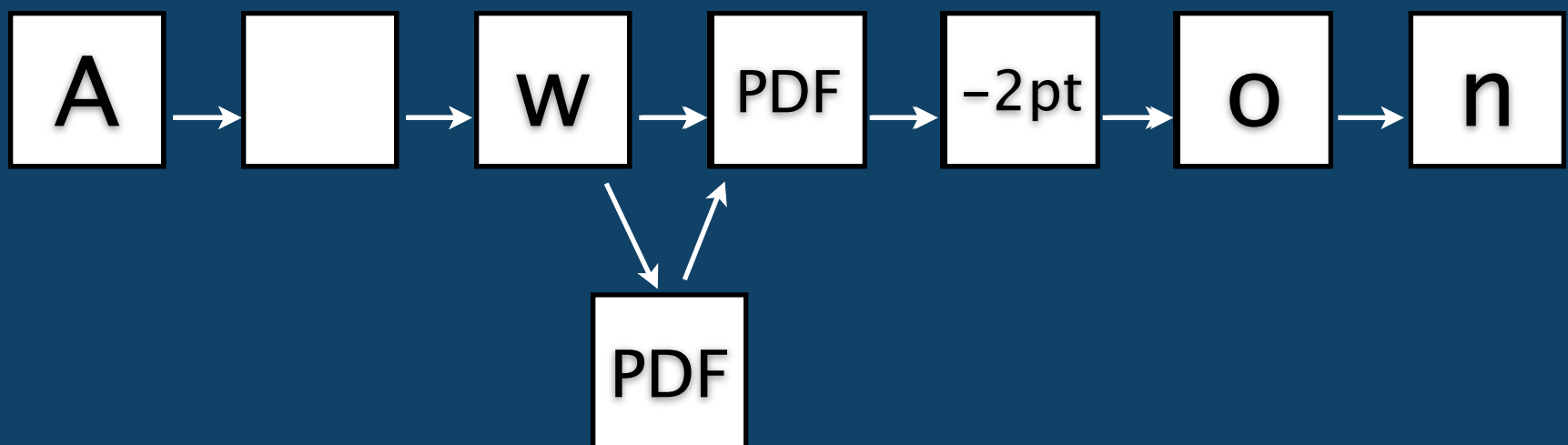
node.new("whatsit","pdf_literal")
node.data = "1 0 0 RG 0 0 10 5 re s"
node.mode = 0
node.next = ...
node.prev = ...

```

Loop

```

current node := beginning of list
while current node is not a valid node
    if current node is a kern, then insert pdf code
    set current node to the next node
end
    
```



Loop

current node := beginning of list

while current node is not nil

 if current node is a hbox/vbox then

 do the same with the contents of the list

 look at current node and insert pdf code

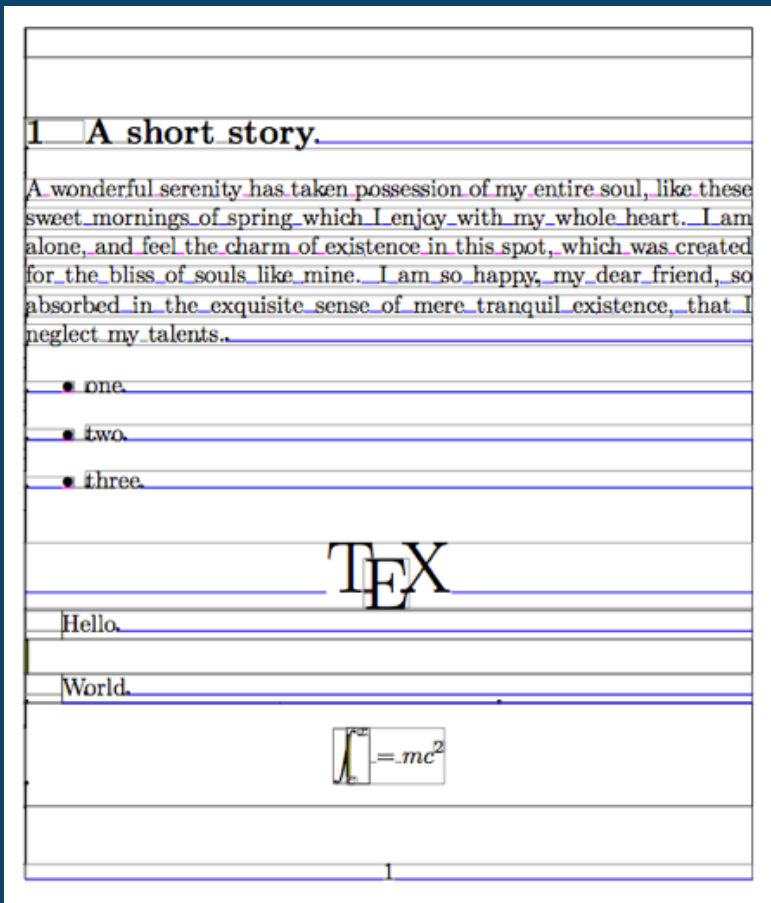
 set current node to the next node

end

In Lua

```
current_node = head
while current_node do
  if current_node.id == node.id("kern") then
    rectangle = node.new("whatsit","pdf_literal")
    rectangle.data = " 1 0 0 RG 0 0 5 10 re s"
    node.insert_before(head,current_node,rectangle)
  elseif current_node.id == node.id("penalty") then
    ....
  end
  current_node = current_node.next
end
```

Back to the example



```
\usepackage{atbegshi}

\AtBeginShipout{

  \directlua{

    analyze_box(

      tex.box["AtBeginShipoutBox"])

  }

}
```

My Conclusion (II)

Writing Lua-code is super simple,
once you understand the underlying
data structure

Part II

How to write T_EX text without any*
backslashes

Demo time!

(*) six backslashes are the minimum?!?

A first document

document.tex

```
\directlua{
    dofile('document.lua')
}

\bye
```

document.lua

```
g = node.new("glyph")
g.char = string.byte('H')
g.font = 1

h = node.hpack(g)

node.write(h)
```