Notes on navigation history

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Abstract

Some notes on a model of navigation history.

1 Introduction

[These are rough notes, working towards a model of navigation history for the web.]

2 Preliminaries

[Define forest, tree, root, total order, equivalence.]

3 Model

A navigation history $H = (D, \rightarrow, \leq, \sim, A)$ consists of:

- a forest (D, \rightarrow) (the document hierarchy),
- a total order (D, \leq) (the chronological order),
- an equivalence relation (D, \sim) (the same-session equivalence), and
- a set $A \subseteq D$ (the active documents),

such that:

- for every d there is a unique $d' \in A$ such that $d \sim d'$,
- for every $d \to e \sim e'$ we have $d \to e'$, and
- for every $d \to e$, we have $d \le e$.

Define:

- d_0 is the unique active root document,
- $d \rightarrow e$ when $d \rightarrow e$ and $e \in A$,

- $FA = \{d \mid d_0 \rightarrow^* d\}$ (the fully active documents),
- $d \lesssim e$ whenever $d \sim e$ and d < e,
- the session future of d is $\{e \mid d \lesssim e\}$,
- the session past of d is $\{e \mid d \gtrsim e\}$,
- the joint session future is $\{e \mid \exists d \in FA : d \leq e\},\$
- the joint session past is $\{e \mid \exists d \in FA : d \gtrsim e\},\$

Define d in H navigates to d' in H' when:

- $d \in A$ and $d' \notin D$,
- $D' = D \cup \{d'\} \setminus \{f \mid \exists e : d \lesssim e \rightarrow^* f\},$
- $e \leq' f$ whenever $e \leq f$, or f = d',
- $e \to f$ whenever $e \to f$ and $f \neq d$, or $e \to d$ and f = d',
- $e \sim' f$ whenever $e \sim f$, or $e \sim d$ and f = d', or $d \sim f$ and e = d', and
- $e \in A'$ whenever $d \in A$ and e = d', or $e \in A$ and $e \neq d$.

Define H traverses the history to d in H' when:

- D' is D,
- <' is <,
- \rightarrow' is \rightarrow ,
- \sim' is \sim , and
- $e \in A'$ whenever $d \not\sim e \in A$, or d = e.

Define H traverses the history by $+\delta$ to H' when:

- the joint session past of H is $d_1 > \cdots > d_{\delta} > \cdots$,
- H traverses the history to d_{δ} in H'

Define H traverses the history by $-\delta$ to H' when:

- the joint session future of H is $d_1 < \cdots < d_{\delta} < \cdots$,
- H traverses the history to d_{δ} in H'

Define H traverses the history by 0 to H' when H = H'. [This defin is meant to align with the spec.]

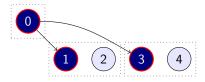
4 Properties

[State some goals, e.g. $go(\delta);go(\delta')$ is the same as $go(\delta + \delta')$, navigate;go(-1) has the same fully active documents as doing nothing, session history can be implemented effeciently in memory...]

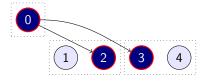
[I suspect none of these are true of the current spec, can we find a model in which they are true?]

Goal 1 If H traverses the history by δ to H' and H' traverses the history by δ' to H" then H traverses the history by $\delta + \delta'$ to H".

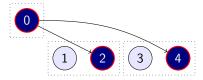
Counterexample 1 Let H be:



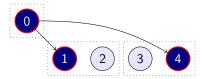
which traverses the history by 1 to:



which traverses the history by 1 to:



but H traverses the history 2 to:



This counterexample is caused by the definition of 'traverses the history by δ ' which only traverses one document's session history. Instead, we should traverse the history of all δ documents.

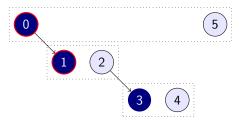
Patch 1 Define H traverses the history by $+\delta$ to H' when:

• the joint session future of H is $d_1 < \cdots < d_\delta < \cdots$,

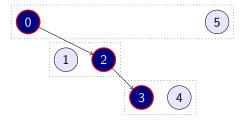
- there is some $H = H_0, \dots, H_{\delta} = H'$, such that
- H_{i-1} traverses the history to d_i in H_i for each $1 \le i \le \delta$. Define H traverses the history by $-\delta$ to H' when:
 - the joint session past of H is $d_1 > \cdots > d_{\delta} > \cdots$,
 - there is some $H = H_0, \dots, H_{\delta} = H'$, such that
 - H_{i-1} traverses the history to d_i in H_i for each $1 \le i \le \delta$.

Unfortunately, Goal 1 is not satisfied, even with this patch.

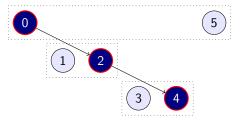
Counterexample 2 Let H be:



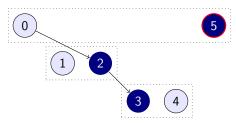
 $which\ moves\ forwards\ by\ 1\ to:$



which in turn moves forwards by 1 to:



but H goes forward by 2 to:



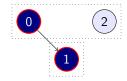
The problem this time is that the definition of 'joint session history' only includes the fully active documents, not all active documents.

Patch 2 Define:

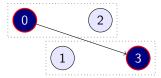
- the joint session future is $\{e \mid \exists d \in A : d \leq e\}$, and
- the joint session past is $\{e \mid \exists d \in A . d \gtrsim e\}$.

Goal 2 If d in H navigates to d' in H', and H' traverses the history by -1 to H", then FA = FA".

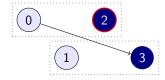
Counterexample 3



navigates 1 to 3 in:



which traverses the history by -1 to:



5 Experiments

[A write-up of CGB's experiments with how different browsers handle navigation.]

6 Specification

[Suggested edits to the spec: 1. traverse to each document, not just the selected one, 2. keep all documents in the seession history, not just the fully active ones, 3. change the session history order.]

7 Conclusion

[We did stuff.]