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 $d \rightarrow e \sim e'$ we have $d \rightarrow e'$, and

- for every $d \rightarrow e$, we have $d \leq e$.

Define:

- d_0 is the unique active root document,

- $d \twoheadrightarrow e$ when $d \rightarrow e$ and $e \in A$,

- a document d is *fully active* whenever $d_0 \twoheadrightarrow^* d$,

- $d \lesssim e$ 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 $\{e \mid \exists d . d_0 \twoheadrightarrow^* d \lesssim e\}$,

- the *joint session past* is $\{e \mid \exists d . d_0 \twoheadrightarrow^* d \gtrsim e\}$,

Define d *in* H *naviagates to* d' *in* H' when:

- $d \in A$ and $d' \notin D$,

- $D' = D \cup \{d'\} \setminus \{f \mid \exists e . d \lesssim e \to^* f\}$,

- $e \le' f$ whenever $e \le f$, or $f = d'$,

- $e \to' f$ whenever $e \to f$ and $f \ne d$, 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 $e \ne d$.

Define H *traverses to* d *in* H' when:

- D' is D,

- $\le'$ is $\le$,

- $\to'$ is $\to$,

- $\sim'$ is $\sim$, and

- $e \in A'$ whenever $d \not\sim e \in A$, or $d = e$.

Define H *goes back by* n *to* H' when:

- the joint session past of H is $d_1 > \cdots > d_n > \cdots$,

- H traverses to d_n in H'

Define H *goes forwards by* n *to* H' when:

- the joint session future of H is $d_1 < \cdots < d_n < \cdots$,

- H traverses to d_n in H'

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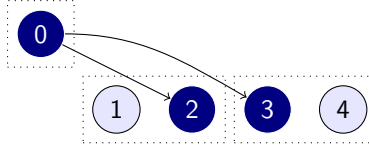
[I suspect none of these are true of the current spec, can we find a model in which they are true?]

Goal 1 *If H goes forward by n to H' and H' goes forward by n' to H'' then H goes forward by $n + n'$ to H'.*
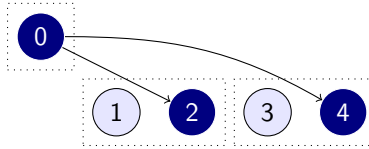
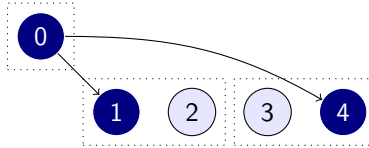**Counterexample 1** *Let H be:*
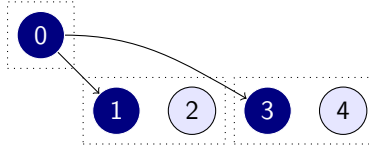
which moves forwards by 1 to:

which in turn moves forwards by 1 to:

but H goes forward by 2 to:

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

Patch 1 *Define H goes forwards by n to H' when:*

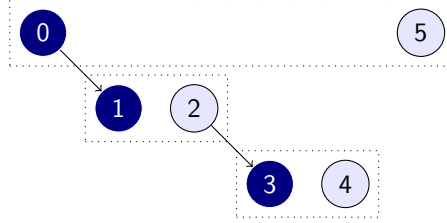- *the joint session future of H is $d_1 < \cdots < d_n < \cdots$,*

- *there is some $H = H_0, \ldots, H_n = H'$, such that*

- H_{i-1} *traverses to d_i in H_i for each $1 \le i \le n$.*

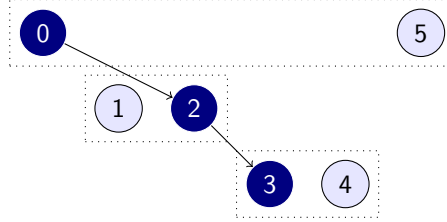*Define H goes back by n to H' when:*

- *the joint session past of H is $d_1 > \cdots > d_n > \cdots$,*

- *there is some $H = H_0, \ldots, H_n = H'$, such that*

- H_{i-1} *traverses to d_i in H_i for each $1 \le i \le n$.*

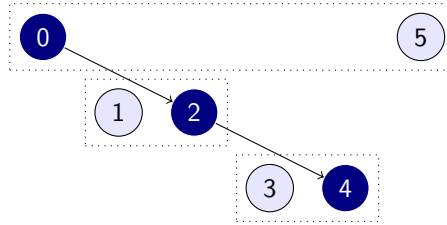Unfortunately, Goal **??** is not satisfied, even with this patch.

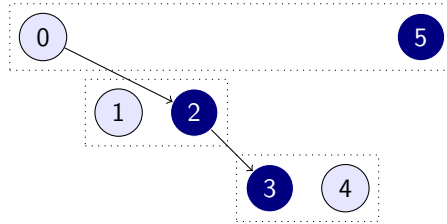**Counterexample 2** *Let H be:*

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* $\{e \mid \exists d \in A \,.\, d \lesssim e\}$*, and*

- *the* joint session past *is* $\{e \mid \exists d \in A \,.\, d \gtrsim e\}$*.*

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.]