Jan Hoffman Lecture 2 [2018/06/83] Post of Lemma 1 P(r,e,r) = If rte:r, and rte:r, then r,=rz. · Case (plus): Then e=plus(e,ez) and T+e,:num and T+ez:num and T:num Since It plus (e, e2): T2 by inversion The,: num It ezinum, and 72: num Thus 7 = T2 = num · (ase (var): Then e=x and \(\Gamma = \Gamma', \text{ x:7,} Since $\Gamma \vdash x: \tau_2$ by inversion $\Gamma = \Gamma'' x: \tau_2$ But then $\Gamma' x: \tau_1 = \Gamma'', x: \tau_2$ and $\tau_1 = \tau_2$ Other cases are similar. Lemma 2 (Substitution) If [x: T + e': T' and [+ e: T then T + [e/x]e': T' EX: $x: num + x \le 5: bool$ - F G: nume' $[c/x]e' = 6 \le 5' boul$

Prof: (by rule induction)

Lemma 3 (weakening) If Ite: T and X & I' then I', x: 7' + e: 7

(The idea is that x: T' must be irrelevant to e: T. Otherwise it would appear in T in the judgment T + e: T.)

Jynamic Sementics (what does it mean to run or evaluate a prog.)

Different Kinds

operational semantics: How to run a grog

axiomatic semantics: What can you prove about

e denotational sementics: Describe programs as mathematical functions

Operational Semantics (our Socus)

today: structural (or small step) operational sym.

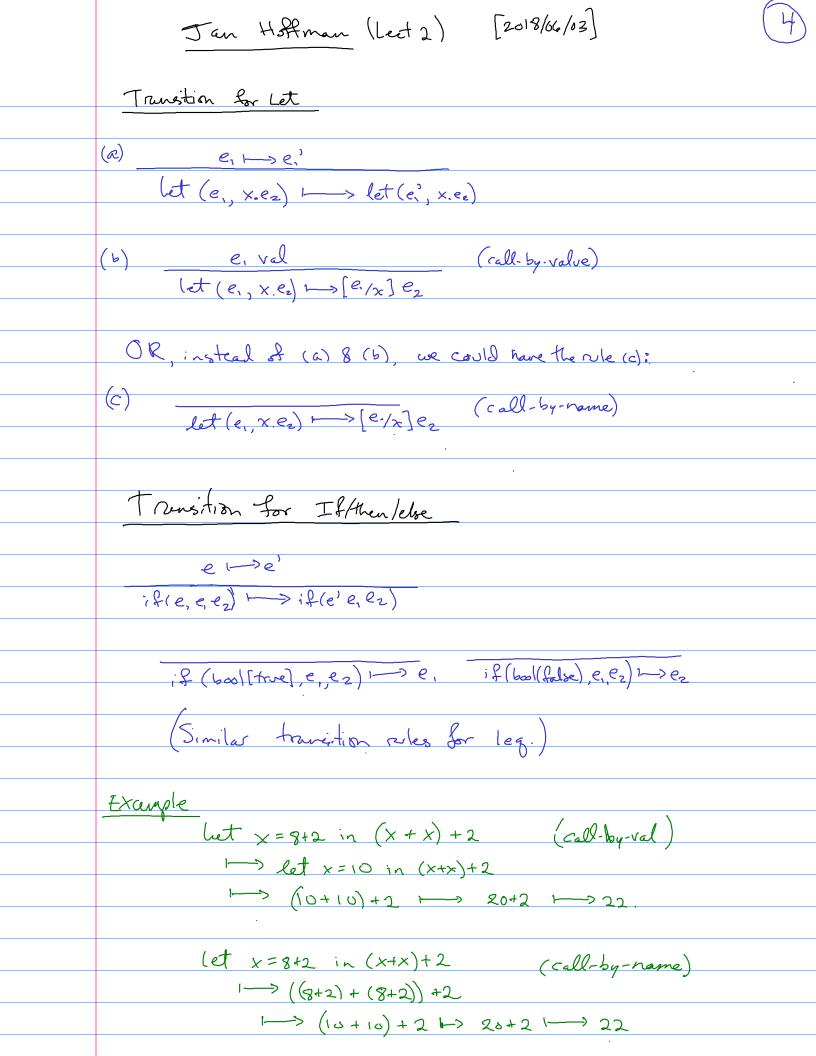
Strictural Dynamics

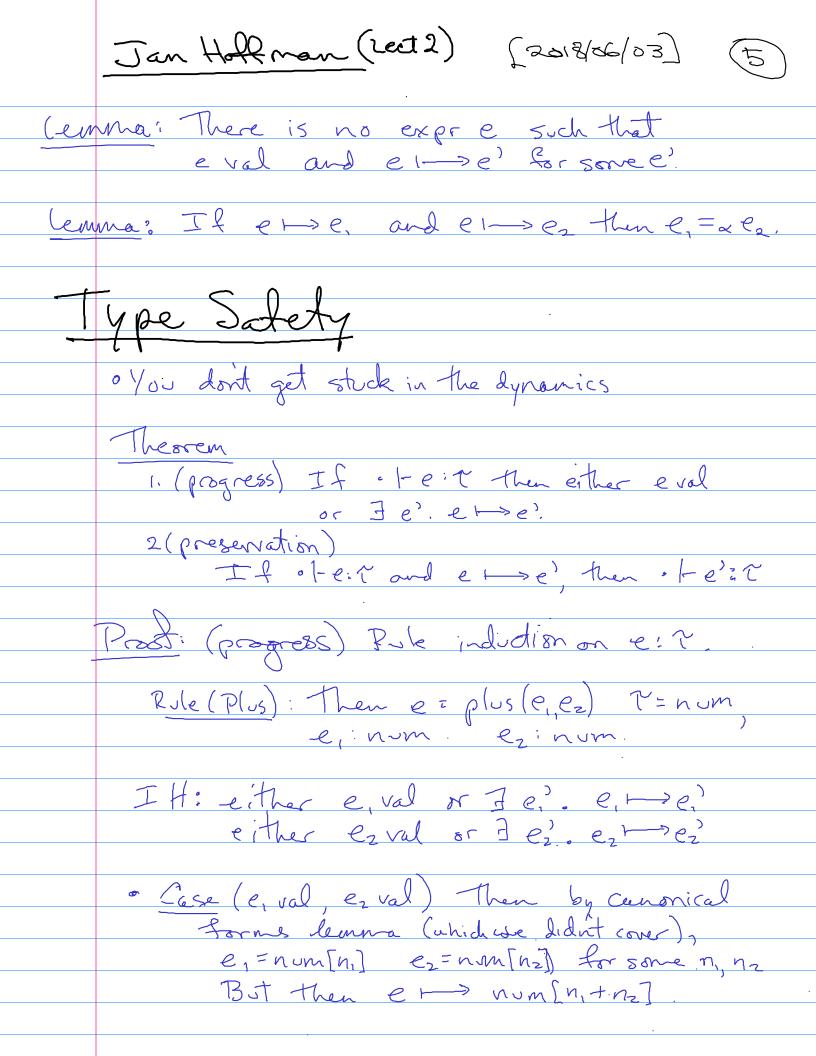
transition system (low level, very flexible)

4 judgments: s state s initial

s final s \rightarrow s'

(s can step to s')





Jan Hoffman (Lect2) [2018/06/03] (6)
· Case (e, val, ezh->e'z) Then by counonical
forme lemma e, = num[n,] and e 1-> plus(num[n], ez)
e -> plus (num[n], ez)
· Case (e, roe,) Then e roplus (e, e2)
() () () () () () () () () ()
We have proved progress for this.
We have proved progress for Plus. We usuld also have to do the same for each of the other rules.
Homework
1- Add Mult
2. De other caroes of progress
3. De preservation post.
3. Da p, 200 (2010).
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