Contents

1 counter Theory

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Parent Theories: sm

1.1 Datatypes

```
ctrcmd = load num | count | hold

ctrOut = DISPLAY num

ctrState = COUNT num
```

1.2 Theorems

[ctr_rules]

```
⊢ (∀ins outs.
     TR (load new) (CFG (load new::ins) (COUNT n) outs)
       (CFG ins (COUNT new) (DISPLAY new::outs))) ∧
  (∀ins outs.
     TR count (CFG (count::ins) (COUNT n) outs)
       (CFG ins (COUNT (n - 1)) (DISPLAY (n - 1)::outs))) ∧
  ∀ins outs.
    TR hold (CFG (hold::ins) (COUNT n) outs)
      (CFG ins (COUNT n) (DISPLAY n::outs))
```

[ctrcmd_distinct_clauses]

```
⊢ (∀a. load a ≠ count) ∧ (∀a. load a ≠ hold) ∧ count ≠ hold
```

[ctrNS_def]

```
⊢ (ctrNS (COUNT n) (load k) = COUNT k) ∧
  (ctrNS (COUNT n) count = COUNT (n - 1)) ∧
  (ctrNS (COUNT n) hold = COUNT n)
```

[ctrNS_ind]

```
⊢ ∀P.
    (∀n k. P (COUNT n) (load k)) ∧ (∀n. P (COUNT n) count) ∧
    (∀n. P (COUNT n) hold) ⇒
    ∀v v1. P v v1
```

[ctrOut_def]

```
⊢ (ctrOut (COUNT n) (load k) = DISPLAY k) ∧
  (ctrOut (COUNT n) count = DISPLAY (n - 1)) ∧
  (ctrOut (COUNT n) hold = DISPLAY n)
```

[ctrOut_ind]

$$\begin{array}{l}\vdash \forall P.\\ \quad (\forall n\ k.\ P\ (\texttt{COUNT}\ n)\ (\texttt{load}\ k)) \land (\forall n.\ P\ (\texttt{COUNT}\ n)\ \texttt{count}) \land\\ \quad (\forall n.\ P\ (\texttt{COUNT}\ n)\ \texttt{hold}) \Rightarrow\\ \quad \forall v\ v_1.\ P\ v\ v_1\end{array}$$

[ctrOut_one_one]

$$\vdash \forall a\ a'.\ (\texttt{DISPLAY}\ a = \texttt{DISPLAY}\ a') \iff (a = a')$$

[ctrState_one_one]

$$\vdash \forall a\ a'.\ (\texttt{COUNT}\ a = \texttt{COUNT}\ a') \iff (a = a')$$

[ctrTR_clauses]

$$\begin{array}{l}\vdash (\forall x\ x1s\ s_1\ out1s\ x2s\ out2s\ s_2.\\ \qquad \texttt{TR}\ x\ (\texttt{CFG}\ x1s\ s_1\ out1s)\ (\texttt{CFG}\ x2s\ s_2\ out2s) \iff\\ \qquad \exists NS\ Out\ ins.\\ \qquad\quad (x1s = x::ins) \land (x2s = ins) \land (s_2 = NS\ s_1\ x) \land\\ \qquad\quad (out2s = Out\ s_1\ x::out1s)) \land\\ \quad \forall x\ x1s\ s_1\ out1s\ x2s\ out2s.\\ \qquad \texttt{TR}\ x\ (\texttt{CFG}\ x1s\ s_1\ out1s)\\ \qquad\quad (\texttt{CFG}\ x2s\ (\texttt{ctrNS}\ s_1\ x)\ (\texttt{ctrOut}\ s_1\ x::out2s)) \iff\\ \qquad \exists ins.\ (x1s = x::ins) \land (x2s = ins) \land (out2s = out1s)\end{array}$$

[ctrTR_rules]

$$\begin{array}{l}\vdash \forall s\ x\ ins\ outs.\\ \qquad \texttt{TR}\ x\ (\texttt{CFG}\ (x::ins)\ s\ outs)\\ \qquad\quad (\texttt{CFG}\ ins\ (\texttt{ctrNS}\ s\ x)\ (\texttt{ctrOut}\ s\ x::outs))\end{array}$$

[ctrTrans_Equiv_TR]

$$\begin{array}{l}\vdash \texttt{TR}\ x\ (\texttt{CFG}\ (x::ins)\ s\ outs)\\ \qquad (\texttt{CFG}\ ins\ (\texttt{ctrNS}\ s\ x)\ (\texttt{ctrOut}\ s\ x::outs)) \iff\\ \quad \texttt{Trans}\ x\ s\ (\texttt{ctrNS}\ s\ x)\end{array}$$

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