REGOLE OPERAZIONALI

A FINE FILE HO DEFINITO TUTTI I TERMINI E SIMBOLI USATI NELLE REGOLE

`Empty(t)`

$$\frac{t \in \text{SETTYPES}}{\text{ENV} \triangleright \text{EMPTY}(t) \Longrightarrow \text{SET}(t, [\,])}$$

`Singleton(t,v)`

$$\frac{t \in \text{SETTYPES} \quad \text{ENV} \triangleright v \Longrightarrow v' \quad \text{TYPEOF}(v') = t}{\text{ENV} \triangleright \text{SINGLETON}(t, v) \Longrightarrow \text{SET}(t, [v'])}$$

`Of(t,argL)`

$$\frac{\text{TYPEOF}(\text{ARGL}) = \text{ARGS} \quad (\forall e_i \in \text{ARGL} : (\text{ENV} \triangleright e_i \Longrightarrow v_i) \wedge (\text{TYPEOF}(v_i) = t) \wedge \text{ADDTO}(v_i, l))}{\text{ENV} \triangleright \text{OF}(t, \text{ARGL}) \Longrightarrow \text{SET}(t, l)}$$

`IsEmpty(set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l)}{\text{ENV} \triangleright \text{ISEMPTY}(\text{SET}) \Longrightarrow \text{BOOL}(l = \emptyset)}$$

`ExistsIn(v,set)`

$$\frac{\text{ENV} \triangleright v \Longrightarrow v' \quad \text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l) \quad \text{TYPEOF}(v') = t}{\text{ENV} \triangleright \text{EXISTSIN}(v, \text{SET}) \Longrightarrow \text{BOOL}(v' \in l)}$$

`ContainsSet(set,set1)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l) \quad \text{ENV} \triangleright \text{SET1} \Longrightarrow \text{SET}(t_1, l_1) \quad t = t_1}{\text{ENV} \triangleright \text{CONTAINSSET}(\text{SET}, \text{SET1}) \Longrightarrow \text{BOOL}(l_1 \subseteq l)}$$

`Put(v,set)`

$$\frac{\text{ENV} \triangleright v \Longrightarrow v' \quad \text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l) \quad \text{TYPEOF}(v') = t}{\text{ENV} \triangleright \text{PUT}(v, \text{SET}) \Longrightarrow \text{SET}(t, l \cup \{v'\})}$$

`Remove(v,set)`

$$\frac{\text{ENV} \triangleright v \Longrightarrow v' \quad \text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l) \quad \text{TYPEOF}(v') = t}{\text{ENV} \triangleright \text{REMOVE}(v, \text{SET}) \Longrightarrow \text{SET}(t, l \setminus \{v'\})}$$

`Union(set1,set2)`

$$\frac{\text{ENV} \triangleright \text{SET1} \Longrightarrow \text{SET}(t_1, l_1) \quad \text{ENV} \triangleright \text{SET2} \Longrightarrow \text{SET}(t_2, l_2) \quad t_1 = t_2}{\text{ENV} \triangleright \text{UNION}(\text{SET1}, \text{SET2}) \Longrightarrow \text{SET}(t, l_1 \cup l_2)}$$

`Intersection(set1,set2)`

$$\frac{\text{ENV} \triangleright \text{SET1} \Longrightarrow \text{SET}(t_1, l_1) \quad \text{ENV} \triangleright \text{SET2} \Longrightarrow \text{SET}(t_2, l_2) \quad t_1 = t_2}{\text{ENV} \triangleright \text{INTERSECTION}(\text{SET1}, \text{SET2}) \Longrightarrow \text{SET}(t, l_1 \cap l_2)}$$

`Difference(set1,set2)`

$$\frac{\text{ENV} \triangleright \text{SET1} \Longrightarrow \text{SET}(t_1, l_1) \quad \text{ENV} \triangleright \text{SET2} \Longrightarrow \text{SET}(t_2, l_2) \quad t_1 = t_2}{\text{ENV} \triangleright \text{DIFFERENCE}(\text{SET1}, \text{SET2}) \Longrightarrow \text{SET}(t, l_1 \setminus \{l_1 \cap l_2\})}$$

`MaxOf(set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l) \quad t = \text{INT} \quad (\exists v \in l : (\forall v' \in l \setminus \{v\} : v' \leq v))}{\text{ENV} \triangleright \text{MAXOF}(\text{SET}) \Longrightarrow \text{INT}(v)}$$

`MinOf(set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t, l) \quad t = \text{INT} \quad (\exists v \in l : (\forall v' \in l \setminus \{v\} : v' \geq v))}{\text{ENV} \triangleright \text{MINOF}(\text{SET}) \Longrightarrow \text{INT}(v)}$$

`For_all(pred,set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t,l) \quad \text{ENV} \triangleright \text{PRED} \Longrightarrow \text{CLOSURE}(\text{ARG}, \text{FBODY}, \text{FENV}) \quad (\forall v \in l : \text{ENV} \triangleright \text{APPLY}(\text{PRED}, v) \Longrightarrow \text{BOOL}(b) \wedge \text{ADDTO}(\text{BOOL}(b), l')) \quad (\forall v' \in l' : v' = \text{BOOL}(\text{TRUE})) \Longrightarrow b'}{\text{ENV} \triangleright \text{FOR\_ALL}(\text{PRED}, \text{SET}) \Longrightarrow \text{BOOL}(b')}$$

`Exists(pred,set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t,l) \quad \text{ENV} \triangleright \text{PRED} \Longrightarrow \text{CLOSURE}(\text{ARG}, \text{FBODY}, \text{FENV}) \quad (\forall v \in l : \text{ENV} \triangleright \text{APPLY}(\text{PRED}, v) \Longrightarrow \text{BOOL}(b) \wedge \text{ADDTO}(\text{BOOL}(b), l')) \quad (\exists v' \in l' : v' = \text{BOOL}(\text{TRUE})) \Longrightarrow b'}{\text{ENV} \triangleright \text{EXISTS}(\text{PRED}, \text{SET}) \Longrightarrow \text{BOOL}(b')}$$

`Filter(pred,set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t,l) \quad \text{ENV} \triangleright \text{PRED} \Longrightarrow \text{CLOSURE}(\text{ARG}, \text{FBODY}, \text{FENV}) \quad (\forall v \in l : \text{ENV} \triangleright \text{APPLY}(\text{PRED}, v) \Longrightarrow \text{BOOL}(b) \wedge \text{ADDTO}(v, l'))}{\text{ENV} \triangleright \text{FILTER}(\text{PRED}, \text{SET}) \Longrightarrow \text{SET}(t, l')}$$

`Map(func,set)`

$$\frac{\text{ENV} \triangleright \text{SET} \Longrightarrow \text{SET}(t,l) \quad \text{ENV} \triangleright \text{FUNC} \Longrightarrow \text{CLOSURE}(\text{ARG}, \text{FBODY}, \text{FENV}) \quad (\forall v \in l : \text{ENV} \triangleright \text{APPLY}(\text{FUNC}, v) \Longrightarrow v' \wedge \text{ADDTO}(v', l'))}{\text{ENV} \triangleright \text{MAP}(\text{PRED}, \text{SET}) \Longrightarrow \text{SET}(t, l')}$$

Osservazioni:

- $=$ ⟶ OPERAZIONE DI CONFRONTO (sia nel caso di tipi che nel caso di valori)
- $\text{TYPEOF}(v)$ ⟶ FUNZIONE CHE DATO UN VALORE RESTITUISCE IL TIPO ASSOCIATO A TALE VALORE.
- SETTYPES ⟶ INSIEME DI TIPI CHE POSSONO ESSERE ASSOCIATI AL TIPO SET.
- ARGS ⟶ TIPO DEFINITO NEL FILE "INTERPRETE.ML" DEL PROGETTO.
- $\text{ADDTO}(v, l)$ ⟶ OPERAZIONE DI AGGIUNTA DEL VALORE v ALLA LISTA l (SE ASSENTE).
- $\geqslant, \leqslant$ ⟶ OPERATORI DI CONFRONTO TRA TIPI INTERI.