Regole Operazionali Progetto PR2

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1 Costruttori

1.1 Empty

$$\overline{\Gamma \vdash Empty(\tau) \Rightarrow set : Set(\tau), set = \emptyset}$$

1.2 Singleton

$$\frac{\Gamma \vdash e \Rightarrow v : \tau}{\Gamma \vdash Singleton(e, \tau) \Rightarrow Set : Set(\tau), v \in set}$$

2 Operazioni di base

2.1 Insert

$$\frac{\Gamma \vdash e \Rightarrow v : \tau, \Gamma \vdash s \Rightarrow set : Set(\tau),}{\Gamma \vdash Insert(s, e) \Rightarrow set : set(\tau), v \in set}$$

2.2 Remove

$$\frac{\Gamma \vdash e \Rightarrow v : \tau, \Gamma \vdash s \Rightarrow set : Set(\tau),}{\Gamma \vdash Remove(s, e) \Rightarrow set : Set(\tau), v \notin set}$$

2.3 IsEmpty

$$\frac{\Gamma \vdash s \Rightarrow set : Set(\tau), set = \emptyset}{\Gamma \vdash IsEmpty(s) \Rightarrow true : Bool}$$

$$\frac{\Gamma \vdash s \Rightarrow set : Set(\tau), set \neq \emptyset}{\Gamma \vdash IsEmpty(s) \Rightarrow false : Bool}$$

2.4 Contains

$$\frac{\Gamma \vdash e \Rightarrow v : \tau, \Gamma \vdash s \Rightarrow set : Set(\tau), v \in set}{\Gamma \vdash Contains(s, e) \Rightarrow true : Bool}$$

$$\frac{\Gamma \vdash e \Rightarrow v : \tau, \Gamma \vdash s \Rightarrow set : Set(\tau), v \notin set}{\Gamma \vdash Contains(s, e) \Rightarrow false : Bool}$$

2.5   IsSubset

$$\frac{\Gamma \vdash s1 \Rightarrow set1 : Set(\tau), \Gamma \vdash s2 \Rightarrow set2 : Set(\tau), s1 \subseteq s2}{\Gamma \vdash IsSubset(s1, s2) \Rightarrow true : Bool}$$

$$\frac{\Gamma \vdash s1 \Rightarrow set1 : Set(\tau), \Gamma \vdash s2 \Rightarrow set2 : Set(\tau), s1 \nsubseteq s2}{\Gamma \vdash IsSubset(s1, s2) \Rightarrow false : Bool}$$

2.6   MinEl

$$\frac{\Gamma \vdash s \Rightarrow set : Set(\tau), set \neq \emptyset, \exists v : \tau \mid v = min(set)}{\Gamma \vdash MinEl(s) \Rightarrow v : \tau}$$

2.7   MaxEl

$$\frac{\Gamma \vdash s \Rightarrow set : Set(\tau), set \neq \emptyset, \exists v : \tau \mid v = max(set)}{\Gamma \vdash MaxEl(s) \Rightarrow v : \tau}$$

2.8   Union

$$\frac{\Gamma \vdash s1 \Rightarrow set1 : Set(\tau), \Gamma \vdash s2 \Rightarrow set2 : Set(\tau)}{\Gamma \vdash Union(s1, s2) \Rightarrow set3 : Set(\tau) \mid set3 = set1 \cup set2}$$

2.9   Intersection

$$\frac{\Gamma \vdash s1 \Rightarrow set1 : Set(\tau), \Gamma \vdash s2 \Rightarrow set2 : Set(\tau)}{\Gamma \vdash Intersection(s1, s2) \Rightarrow set3 : Set(\tau) \mid set3 = set1 \cap set2}$$

2.10   Difference

$$\frac{\Gamma \vdash s1 \Rightarrow set1 : Set(\tau), \Gamma \vdash s2 \Rightarrow set2 : Set(\tau)}{\Gamma \vdash Intersection(s1, s2) \Rightarrow set3 : Set(\tau) \mid set3 = set1 \setminus set2}$$

3   Operazioni funzionali

3.1   For_all

$$\frac{\Gamma \vdash s \Rightarrow set : Set(\tau), \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \Gamma \vdash IsEmpty(s) \Rightarrow true : Bool}{\Gamma \vdash For\_all(fn, s) \Rightarrow true : Bool}$$

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau), \\ \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \\ \Gamma \vdash IsEmpty(s) \Rightarrow false : Bool, \\ set = \{v\} \cup (set \setminus \{v\}), \\ b1 = fun(v) : Bool, \\ b2 = For\_all(fn, (s \setminus \{v\})) \end{array}}{\Gamma \vdash For\_all(fn, s) \Rightarrow b1 \wedge b2 : Bool}$$

3.2 Exists

$$\frac{\Gamma \vdash s \Rightarrow set : Set(\tau), \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \Gamma \vdash IsEmpty(s) \Rightarrow true : Bool}{\Gamma \vdash Exists(fn, s) \Rightarrow false : Bool}$$

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau), \\ \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \\ \Gamma \vdash IsEmpty(s) \Rightarrow false : Bool, \\ set = \{v\} \cup (set \setminus \{v\}), \\ b1 = fun(v) : Bool, \\ b2 = Exists(fn, (s \setminus \{v\})) \end{array}}{\Gamma \vdash Exists(fn, s) \Rightarrow b1 \vee b2 : Bool}$$

3.3 Filter

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau), \\ \Gamma \vdash IsEmpty(s) \Rightarrow true : Bool, \\ \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \end{array}}{\Gamma \vdash Filter(fn, s) \Rightarrow s : Set(\tau)}$$

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau), \\ \Gamma \vdash IsEmpty(s) \Rightarrow false : Bool, \\ \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \\ set = \{v\} \cup (set \setminus \{v\}), \\ fun(v) = true : Bool \Rightarrow s' = \{v\} \cup Filter(fn, (s \setminus \{v\})) \end{array}}{\Gamma \vdash Filter(fn, s) \Rightarrow s' : Set(\tau)}$$

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau), \\ \Gamma \vdash IsEmpty(s) \Rightarrow false : Bool, \\ \Gamma \vdash fn \Rightarrow fun : \tau \rightarrow Bool, \\ set = \{v\} \cup (set \setminus \{v\}), \\ fun(v) = false : Bool \Rightarrow s' = Filter(fn, (s \setminus \{v\})) \end{array}}{\Gamma \vdash Filter(fn, s) \Rightarrow s' : Set(\tau)}$$

3.4 Map

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau_1), \\ \Gamma \vdash IsEmpty(s) \Rightarrow true : Bool, \\ \Gamma \vdash fn \Rightarrow fun : \tau_1 \rightarrow \tau_2, \end{array}}{\Gamma \vdash Map(fn, s) \Rightarrow s : Set(\tau_1)}$$

$$\frac{\begin{array}{c} \Gamma \vdash s \Rightarrow set : Set(\tau_1), \\ \Gamma \vdash IsEmpty(s) \Rightarrow false : Bool, \\ \Gamma \vdash fn \Rightarrow fun : \tau_1 \rightarrow \tau_2, \\ set = \{v\} \cup (set \setminus \{v\}), \\ fun(v) = v' : \tau_2 \Rightarrow s' = \{v'\} \cup Map(fn, (s \setminus \{v\})) \end{array}}{\Gamma \vdash Map(fn, s) \Rightarrow s' : Set(\tau_2)}$$