William Daniels

CSCI 4202

Artificial Intelligence

Homework #6 03/08/15

First, we will convert all of the axioms into clause form:

(1) **move(x, s)**

$$AT(monkey, b, s_1) \vee ONCHAIR(s_1) \vee AT(monkey, x_1, move(x_1, s_1))$$

(2) **carry(x,s)**

$$\neg AT(monkey, b, s_2) \vee ONCHAIR(s_2) \vee AT(char, x_2, carry(x_2, s_2))$$

(3) **climb(s)**

(3.1) $\neg AT(char, x_{3.1}, s_{3.1}) \vee AT(char, x_{3.1}, climb(s_{3.1}))$

(3.2) $ONCHAIR(climb(s_{3.2}))$

(3.3) $\neg ONCHAIR(s_{3.3}))$

(4) **knock(s)**

$$\neg ONCHAIR(s_4) \vee AT(chair, c, s_4) \vee HB(knock(s_4))$$

(5) $\neg AT(monkey, a, s_5) \vee \neg AT(monkey, b, s_5), b \neq a$

Now, our state space starts as:

$$\neg ONCHAIR(s_0), \neg HB(s_0), AT(monkey, a, s_0), AT(chair, b, s_0), AT(banana, c, s_0)$$

which can be interpreted as various axioms of:

(6.1) $ONCHAIR(s_1)$

(6.2) $\neg HB(s_0)$

(6.3) $AT(monkey, a, s_0)$

(6.4) $AT(chair, b, s_0)$

(6.5) $AT(banana, c, s_0)$

We are trying to prove that $\exists s HB(s)$

Proof that a monkey can have a banana: (you'll notice our first step is to negate our assumption) Since i'm using tex, making the nice 'tree' like diagram in the notes is difficult, so instead I'll be using the format: leftHandSide Axiom $\rightarrow$ negated with right hand side axiom, Substitutions will be in parenthesis.

(a) $\neg HB(s_6) \rightarrow 4 \left(\frac{knock(s_4)}{s_6}\right)$

(b) $\neg ONCHAIR(s_4) \vee AT(chair, c, s_4) \rightarrow 3.2 \left(\frac{climb(s_{3.2})}{s_4}\right)$

(c) $\neg AT(chair, c, climb(s_{3.2})) \rightarrow 3.1 \left(\frac{c}{x_{3.1}}\right), \left(\frac{s_{3.2}}{s_{3.1}}\right)$

(d) $\neg AT(char, x_{3.1}, s_{3.1}) \rightarrow 1 \left(\frac{b}{x_{3.1}}\right), \left(\frac{s_1}{s_{3.1}}\right)$

(e) $ONCHAIR(s_1) \vee AT(monkey, x_1, move(x_1, s_1)) \rightarrow 3.3 \left(\frac{s_1}{s_{3.3}}\right)$

(f) $AT(monkey, x_1, move(x_1, s_{3.3})) \rightarrow 5 \left(\frac{x_1}{b}\right), \left(\frac{move(x_1, s_{3.3})}{s_5}\right)$

(g) $\neg AT(monkey, a, s_5) \rightarrow 6.3 \left(\frac{s_5}{s_0}\right)$

(h) $\square$