# 10-1

## 1

**case1**

代换 Sv：

$$\alpha \to \alpha\beta \to pointer(\alpha)\gamma \to \beta\delta \to \beta$$

使得

$$S(a) = S(b) = (pointer(\alpha)) \times (\beta \to \beta)$$

代换 Sv'：

$$\alpha \to int\beta \to pointer(int)\gamma \to pointer(int)\delta \to pointer(int)$$

使得

$$S^{'}(a) = S^{'}(b) = (pointer(int)) \times (pointer(int) \to pointer(int))$$

所以 Sv 是最一般的合一代换。

**case2**

此时不存在某个代换 Sv 使得 S(a) = S(b)，所以这两个表达式 a 和 b 不能合一。

## 2

| 编号 | 定型断言 | 代换 | 规则 |
|---|---|---|---|
| 1 | f:$\alpha$ | | (Exp Id) |
| 2 | l:$\beta$ | | (Exp Id) |
| 3 | map: $\gamma$ | | (Exp Id) |
| 4 | map(f,l): $\delta$ | $\gamma = (\alpha, \beta) \to \delta$ | (Exp Funcall) |
| 5 | null: $list(\alpha_0) \to boolean$ | | (Exp Id Fresh) |
| 6 | null ( l ): boolean | $\beta = list(\alpha_0)$ | (Exp Funcall) 和 (2) |
| 7 | nil : $list(\alpha_1)$ | | (Exp Id Fresh) |
| 8 | l : $list(\alpha_0)$ | | (2) |
| 9 | hd: $list(\alpha_2) \to \alpha_2$ | | (Exp Id Fresh) |
| 10 | hd ( l ):$\alpha_0$ | $\alpha_2 = \alpha_0$ | (Exp Funcall) |
| 11 | f ( hd ( l ) ) : $\alpha_3$ | $\alpha = \alpha_0 \to \alpha_3$ | ( Exp Id ) |

| 编号 | 定型断言 | 代换 | 规则 |
|---|---|---|---|
| 12 | f: $\alpha_0 \to \alpha_3$ | | (1) |
| 13 | tl: $list(\alpha_4) \to list(\alpha_4)$ | | (Exp Id Fresh) |
| 14 | tl ( l ): $list(\alpha_0)$ | $\alpha_4 = \alpha_0$ | (Exp Funcall) |
| 15 | map : $((\alpha_0 \to \alpha_3) \times list(\alpha_0)) \to \delta$ | | (3) |
| 16 | map ( f , tl ( l ) ) : $\delta$ | | (Exp Funcall) |
| 17 | cons:$\alpha_5 \times list(\alpha_5) \to list(\alpha_5)$ | | (Exp Id Fresh) |
| 18 | cons (f (hd (l)), map (f, tl (l ) ) ):$list(\alpha_3)$ | $\alpha_5 = \alpha_3, \delta = list(\alpha_3)$ | (Exp Funcall) |
| 19 | if : $boolean \times list(\alpha_6) \times list(\alpha_6) \to list(\alpha_6)$ | | (Exp Id Fresh) |
| 20 | if...: $list(\alpha_1)$ | $\alpha_6 = \alpha_1, \alpha_3 = \alpha_1$ | (Exp Funcall) |
| 21 | match : $\alpha_7 \times \alpha_7 \to \alpha_7$ | | (Exp Id Fresh) |
| 22 | match ... : $list(\alpha_1)$ | $list(\alpha_7) = \alpha_1$ | (Exp Funcall) |