Assignment 2: Verification

Maxwell Bo 43926871

April 11, 2017

1 Part A

Given

$$\begin{aligned} pre &\triangleq D.len \geqslant max(\{A.len,\ B.len,\ C.len\}) \\ &\wedge \ \ sorted(A) \ \wedge \ sorted(B) \ \wedge \ sorted(C) \end{aligned}$$

and

$$\begin{aligned} post &\triangleq D = A \cap B \cap C \\ &\wedge \ \ r \in [0, D.len] \ \wedge \ i \in [0, A.len] \ \wedge \ j \in [0, B.len] \ \wedge \ k \in [0, C.len] \\ &\wedge \ \ (i = A.len \vee j = B.len \vee k = C.len) \end{aligned}$$

$$\begin{aligned} & i, j, k, r, D : [pre, post] \\ \sqsubseteq \ & \{\text{Composition: middle predicate is } inv\} \\ & i, j, k, r, D : [pre, inv];\ i, j, k, r, D : [inv, post] \end{aligned}$$

where

$$\begin{aligned} inv &\triangleq D_{[0,r)} = A_{[0,i)} \cap B_{[0,j)} \cap C_{[0,k)} \\ &\wedge \ \ r \in [0, D.len] \ \wedge \ i \in [0, A.len] \ \wedge \ j \in [0, B.len] \ \wedge \ k \in [0, C.len] \end{aligned}$$

$$\begin{aligned} \sqsubseteq \ & \{\text{Assignment: } pre \Rrightarrow inv[i, j, k, r \backslash 0, 0, 0, 0]\} \\ & i, j, k, r = 0, 0, 0, 0;\ i, j, k, r, D : [inv, post] \end{aligned}$$

where

$$\begin{aligned} inv[i, j, k, r \backslash 0, 0, 0, 0] &\equiv D_{[0,0)} = A_{[0,0)} \cap B_{[0,0)} \cap C_{[0,0)} \\ &\quad \wedge \ 0 \in [0, D.len] \ \wedge \ 0 \in [0, A.len] \ \wedge \ 0 \in [0, B.len] \ \wedge \ 0 \in [0, C.len] \\ &\equiv \varnothing = (\varnothing \cap \varnothing \cap \varnothing) \ \wedge \ (\text{true} \ \wedge \ \text{true} \ \wedge \ \text{true} \ \wedge \ \text{true}) \\ &\equiv \varnothing = \varnothing \ \wedge \ \text{true} \\ &\equiv \text{true} \end{aligned}$$