

Chapter 36 : The Max location problem.

In which we also apply Searching by Elimination.

Let $g[M..N]$ be an array of int $\{M \leq N\}$. We are asked to find the location of the largest element in g .

We shall apply the searching by elimination algorithm. We begin by defining F

* (0) $F.x \equiv \langle \forall i :: g.i \leq g.x \rangle$

We can now specify our problem as follows.

Pre: $\langle \exists k : M \leq k \leq N : F.k \rangle$

Post : $F.x$

We now calculate our guards

$$\begin{aligned} & F.a \Rightarrow F.b \\ = & \quad \{ \text{definition of } F \} \\ & \langle \forall i :: g.i \leq g.a \rangle \Rightarrow \langle \forall i :: g.i \leq g.b \rangle \\ \Leftarrow & \quad \{ \leq \text{transitive} \} \\ & g.a \leq g.b \end{aligned}$$

By symmetry, $(F.b \Rightarrow F.a) \Leftarrow g.b \leq g.a$

And thus, using the symmetric linear search, we arrive at our finished program

```
a, b := M, N
;do a ≠ b → {M ≤ a < b ≤ N}

    if g.a ≤ g.b → a := a + 1
    [] g.b ≤ g.a → b := b - 1
    fi

od
; x := a
```