Strongest Postcondition

Andreas Podelski

November 28, 2011

 \blacktriangleright given a Hoare triple $\{\phi\}$ C $\{\psi\}$,

- given a Hoare triple $\{\phi\}$ C $\{\psi\}$,
- construct a forwards derivation

- given a Hoare triple $\{\phi\}$ C $\{\psi\}$,
- construct a forwards derivation
- derivation = sequence of Hoare triples,
 each Hoare triple is an axiom (skip, update)
 or it is inferred by one of the inference rules (seq, cond, while)

- given a Hoare triple $\{\phi\}$ C $\{\psi\}$,
- construct a forwards derivation
- derivation = sequence of Hoare triples,
 each Hoare triple is an axiom (skip, update)
 or it is inferred by one of the inference rules (seq, cond, while)
- lacktriangleright Hoare triples with ψ and strongest postcondition for larger and larger program fragments

- given a Hoare triple $\{\phi\}$ C $\{\psi\}$,
- construct a forwards derivation
- derivation = sequence of Hoare triples,
 each Hoare triple is an axiom (skip, update)
 or it is inferred by one of the inference rules (seq, cond, while)
- ▶ Hoare triples with ψ and strongest postcondition for larger and larger program fragments
- verification condition: strongest postcondition of ϕ under C entails ψ (+ special treatment of while)

ightharpoonup post(\mathbf{skip}, ϕ) =

- ightharpoonup post(skip, ϕ) = ϕ

- ightharpoonup post(skip, ϕ) = ϕ
- $post(x := e, \phi) = ?$
- ▶ post(C_1 ; C_2 , ϕ) =

- ightharpoonup post(skip, ϕ) = ϕ
- $post(x := e, \phi) = ?$
- ▶ post(if *b* then C_1 else C_2 , ϕ) =

- ightharpoonup post(skip, ϕ) = ϕ
- post($x := e, \phi$) = ?
- ▶ post(if *b* then C_1 else C_2 , ϕ) = post($b \land \phi$) \land ($\neg b \land \phi$)
- ▶ post(while *b* do $\{\theta\}$ C_0, ϕ) =

- ightharpoonup post(skip, ϕ) = ϕ
- $post(x := e, \phi) = ?$
- ▶ post(if *b* then C_1 else C_2 , ϕ) = post($b \land \phi$) \land ($\neg b \land \phi$)
- ▶ post(while *b* do $\{\theta\}$ C_0, ϕ) = $\theta \land \neg b$
- ightharpoonup next: static analysis constructs candidate for θ via forward analysis "reachability analysis"