

SAT

function SAT(ϕ)

/* determines the set of states satisfying ϕ */

begin

case

ϕ is $\top$: return S

ϕ is $\perp$: return $\emptyset$

ϕ is atomic: return $\{s \in S \mid \phi \in L(s)\}$

ϕ is $\neg\phi_1$: return $S - \text{SAT}(\phi_1)$

ϕ is $\phi_1 \wedge \phi_2$: return $\text{SAT}(\phi_1) \cap \text{SAT}(\phi_2)$

ϕ is $\phi_1 \vee \phi_2$: return $\text{SAT}(\phi_1) \cup \text{SAT}(\phi_2)$

ϕ is $\phi_1 \rightarrow \phi_2$: return $\text{SAT}(\neg\phi_1 \vee \phi_2)$

ϕ is $\text{AX } \phi_1$: return $\text{SAT}(\neg\text{EX } \neg\phi_1)$

→ ϕ is $\text{EX } \phi_1$: return $\text{SAT}_{\text{EX}}(\phi_1)$

ϕ is $\text{A}[\phi_1 \text{ U } \phi_2]$: return $\text{SAT}(\neg(\text{E}[\neg\phi_2 \text{ U } (\neg\phi_1 \wedge \neg\phi_2)]))$

→ ϕ is $\text{E}[\phi_1 \text{ U } \phi_2]$: return $\text{SAT}_{\text{EU}}(\phi_1, \phi_2)$

ϕ is $\text{EF } \phi_1$: return $\text{SAT}(\text{E}(\top \text{ U } \phi_1))$

ϕ is $\text{EG } \phi_1$: return $\text{SAT}(\neg\text{AF } \neg\phi_1)$

→ ϕ is $\text{AF } \phi_1$: return $\text{SAT}_{\text{AF}}(\phi_1)$

ϕ is $\text{AG } \phi_1$: return $\text{SAT}(\neg\text{EF } \neg\phi_1)$

end case

end function

EX, AF

function $SAT_{EX}(\phi)$

/* determines the set of states satisfying ϕ */

local var X, Y

begin

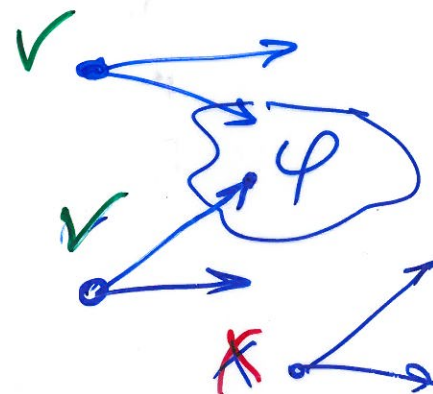
$X := SAT(\phi);$

$Y := \text{pre}_{\exists}(X);$

return Y

end

states which
can make
a transition
into X



function $SAT_{AF}(\phi)$

/* determines the set of states satisfying ϕ */

local var X, Y

begin

$X := S;$

$Y := SAT(\phi);$

repeat until $X = Y$

begin

$X := Y;$

$Y := Y \cup \text{pre}_{\forall}(Y)$

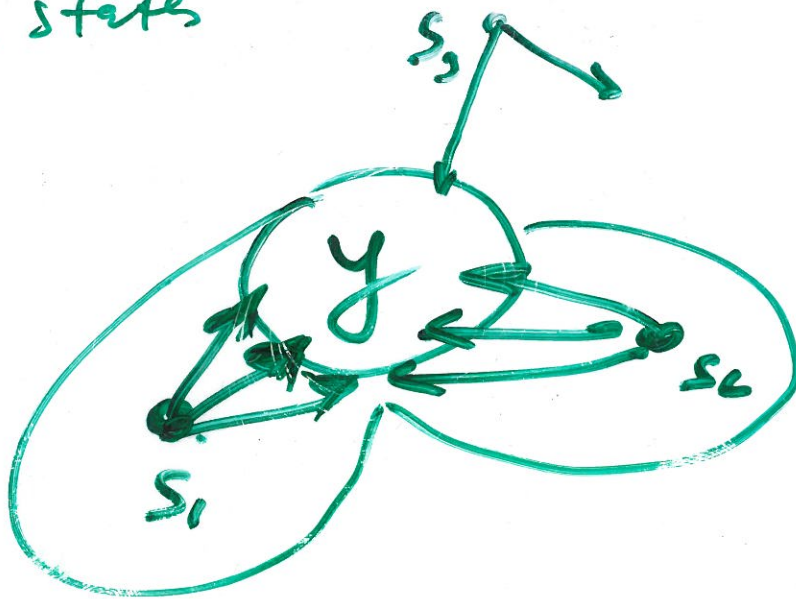
end

return Y

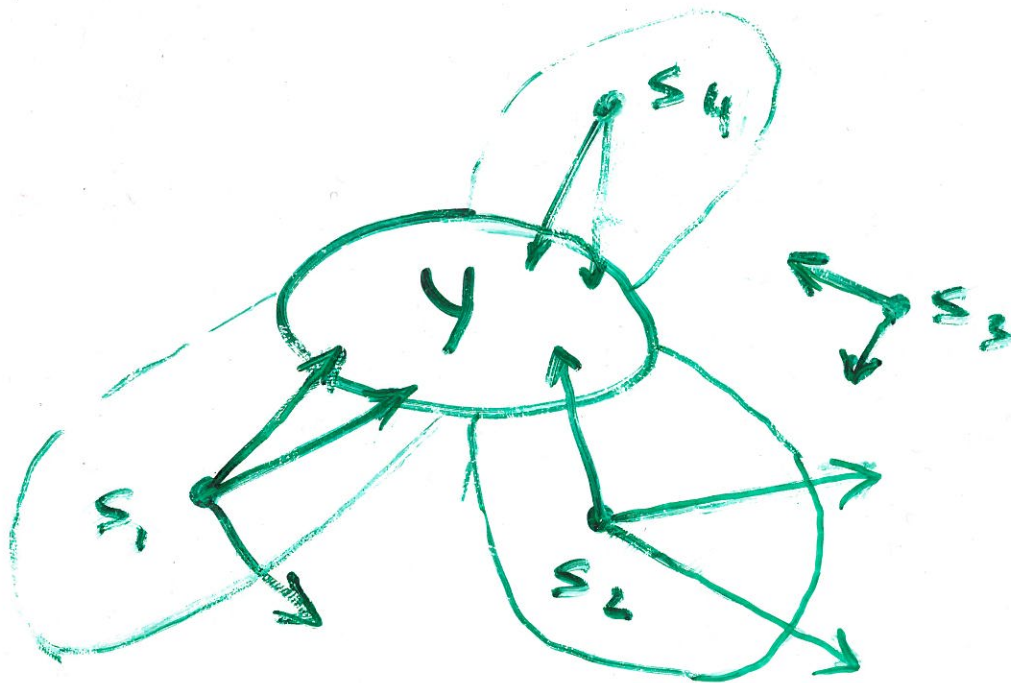
end

set of states which
make transitions
only into Y

Y is a set of states



$$\text{pre}_Y(Y) = \{s_1, s_2\}$$



$$\text{pre}_Y(Y) = \{s_1, s_2, s_4\}$$

EG

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function SATEG ( $\phi$ )
/* determines the set of states satisfying EC
local var  $X, Y$ 
begin
   $Y := \text{SAT}(\phi);$ 
   $X := \emptyset;$ 
  repeat until  $X = Y$ 
  begin
     $X := Y;$ 
     $Y := Y \cap \text{pre}_{\exists}(Y)$ 
  end
  return  $Y$ 
end

```

can replace
with
 $Y := \text{SAT}(\phi) \cap \text{pre}_{\exists}(Y)$