tcs Research

Inventing for impact

PROTON: PRObes for Termination Or Not

Ravindra Metta[1,2] · ***r.metta@tcs.com***

joint work with:-

Hrishikesh Karmarkar[1], Kumar Madhukar[4],
R. Venkatesh[1], Supratik Chakraborty[3].

1. TCS Research. 2. TUM. 3. IIT-B, 4. IIT-D

April 6, 2024

PROTON: PRObes for Termination Or Not

- Recurrent sets. Ashutosh Gupta et al. *Proving non-termination*. POPL'08
- A *recurrent set* R is a set of program states at the loop head such that
  - ∀ *s* ∈ R, s satisfies the loop guard
  - ∃ a reachable state *s* ∈ R
  - ∀ *s* ∈ R, some successor(*s*),after executing the loop body, ∈ R
    - loop forever by taking such successors

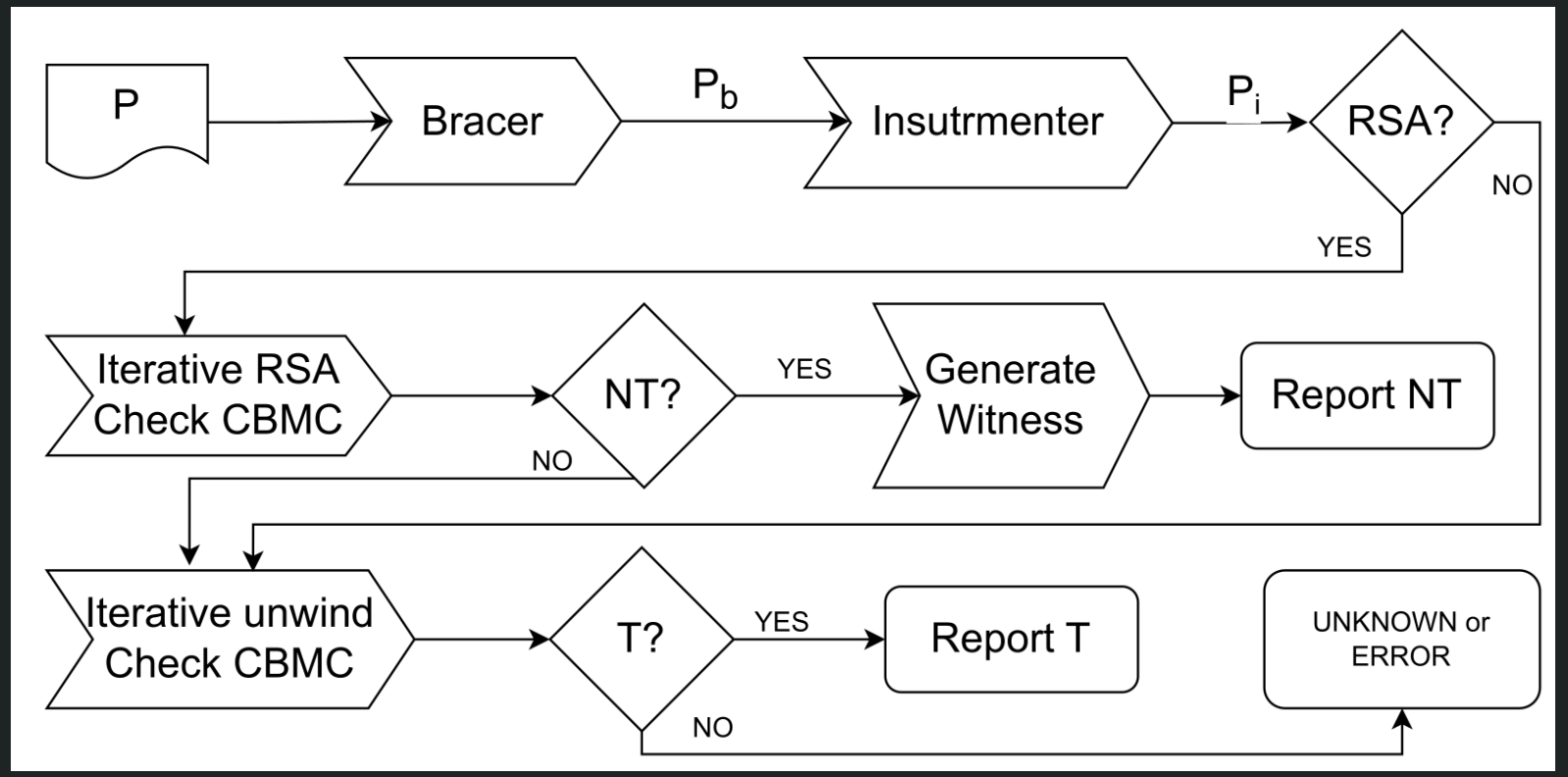
PROTON: NT Checking Example

```
1  i = __VERIFIER_nondet_int();
2  while (i < 10) {
3     if (i != 3) {
4        i = i+1;
5     }
6  }
```

```
1  i = __VERIFIER_nondet_int();
2  bool pStored0 = false;
3  while (i < 10) {
4     bool flag =
           __VERIFIER_nondet_bool();
5     static int oi;
6     if(pStored0)
           __CPROVER_assert(!(oi==i),"RSF");}
7     if(flag){oi=i;pStored0=true;}
8     if (i != 3) {
9      i = i+1;
10    }
11 }
```

PROTON: tool flow

https://github.com/kumarmadhukar/term



PROTON: SVCOMP'24 NT Subset

SVCOMP'24 (818 tasks)	PROTON	U Automizer	2LS
Confirmed	501 in 540s	537 in 18000s	484 in 310s
Unconfirmed	126 in 2200s	11 in 1400 s	201 in 26000s
	18 unique		

Far from the unknown unwindings' unscalable end,
The straying states may sober to stay,
Via sequenced inputs that force a bend,
To assume their repetitious tenor without sway.

tcs Research

Inventing for impact

Thank you