Register Value Analyzer

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```
1  main:
2      addi    s0, s0, 1
3  # print s0 as an integer
4      mv      a0, s0
5      li      a7, 1
6      ecall
7      ret
```

```
~/d/u/w/riscv-analysis $ ./target/debug/rva lint 229-examples/use-before-assign.s
Error: Invalid use before assignment
 in file: /home/nju/documents/university/work-2024/riscv-analysis/229-examples/use-before-assign.
s
   |
 2 | addi    s0, s0, 1
   |              ^^
```

```
1  main:
2      # Load values
3      li        a0, 10
4      li        a1, 20
5      # Print a0 value as an integer
6      li        a7, 1
7      ecall
8      ret
```

```
~/d/u/w/riscv-analysis $ ./target/debug/rva lint 229-examples/unused-value.s
Warning: Unused value
 in file: /home/nju/documents/university/work-2024/riscv-analysis/229-examples/unused-value.s
   |
 4 | li        a1, 20
   |           ^^
```
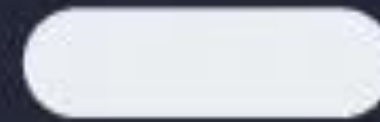
Register Value Analyzer

Name	Call Number (a7)	Description	Inputs	Outputs
PrintInt	1	Prints an integer	a0 = integer to print	N/A

S0 is live before it is defined

		define	use	
1	main:			live = {s0}
2	addi s0, s0, 1	s0	s0	live = {s0}
3	# print s0 as an integer			
4	mv a0, s0	a0	s0	live = {a0}
5	li a7, 1	a7		live = {a0,a7}
6	ecall		a0, a7	live = { }
7	ret			live = { }

Bkpt	Address	Code	Basic	Source		
☐	0x00400000	0x00140413	addi x8,x8,0x00000001	2:	addi	s0, s0, 1
☐	0x00400004	0x00800533	add x10,x0,x8	4:	mv	a0, s0
☐	0x00400008	0x00100893	addi x17,x0,0x00000001	5:	li	a7, 1
☐	0x0040000c	0x00000073	ecall	6:	ecall	
☐	0x00400010	0x00008067	jalr x0,x1,0x00000000	7:	ret	

		define	use	
1	main:			live = {s0}
2	addi s0, s0, 1	s0	s0	live = {s0}
3	# print s0 as an integer			
4	mv a0, s0	a0	s0	live = {a0}
5	li a7, 1	a7		live = {a0,a7}
6	ecall		a0, a7	live = { }
7	ret			live = { }

Bkpt	Address	Code	Basic	Source
☐	0x00400000	0x00140413	addi x8,x8,0x00000001	2: addi s0, s0, 1
☐	0x00400004	0x00800533	add x10,x0,x8	4: mv a0, s0
☐	0x00400008	0x00100893	addi x17,x0,0x00000001	5: li a7, 1
☐	0x0040000c	0x00000073	ecall	6: ecall
☐	0x00400010	0x00008067	jalr x0,x1,0x00000000	7: ret

define

a0   a7   s0

use

a0   a7   s0

Address	Binary Code
0x00801014	0xFFFFFFFF
0x00801010	0x00008067
0x0080100C	0x00000073
0x00801008	0x00100893
0x00801004	0x09899533
0x00801000	0x00140413

	define	use	
1 main:			live = {s0}
2 addi s0, s0, 1	s0	s0	live = {s0}
3 # print s0 as an integer			
4 mv a0, s0	a0	s0	live = {a0}
5 li a7, 1	a7		live = {a0,a7}
6 ecall		a0,a7	live = { }
7 ret			live = { }
			live = { }

Address	Binary Code
0x00801014	0xFFFFFFFF
0x00801010	0x00008067
0x0080100C	0x00000073
0x00801008	0x00100893
0x00801004	0x09899533
0x00801000	0x00140413

define

a0	a7	s0
0	0	1
1	0	0
0	1	0
0	0	0
0	0	0

use

a0	a7	s0
0	0	1
0	0	1
0	0	0
1	1	0
0	0	0

Bkpt	Address	Code	Basic	Source
☐	0x00400000	0x00140413	addi x8,x8,0x00000001	2:	addi	s0, s0, 1
☐	0x00400004	0x00800533	add x10,x0,x8	4:	mv	a0, s0
☐	0x00400008	0x00100893	addi x17,x0,0x00000001	5:	li	a7, 1
☐	0x0040000c	0x00000073	ecall	6:	ecall	
☐	0x00400010	0x00008067	jalr x0,x1,0x00000000	7:	ret	

a0=x10; a7=x17; s0=x8

Address   **Binary Code**   define   use

0x00801014   0xFFFFFFFF
0x00801010   0x00008067   00000000000000000000000100000000   00000000000000000000000100000000
0x0080100C   0x00000073   00000000000000000001000000000   00000000000000000000100000000
0x00801008   0x00100893   00000000000001000000000000000000   00000000000000000000000000000000
0x00801004   0x09899533   00000000000000000000000000000000   00000000000010000001000000000
0x00801000   0x00140413   00000000000000000000000000000000   00000000000000000000000000000000

```
1  main:
2      # Load values
3      li        a0, 10
4      li        a1, 20
5      # Print a0 value as an integer
6      li        a7, 1
7      ecall
8      ret
```

a1 is not live immediately after its definition

```
~/d/u/w/riscv-analysis $ ./target/debug/rva lint 229-examples/unused-value.s
Warning: Unused value
 in file: /home/nju/documents/university/work-2024/riscv-analysis/229-examples/unused-value.s
   |
 4 | li        a1, 20
   |           ^^
```