Flow Propagation Algorithm

3. April 2020

1 FPA for Forward Slicing

1.1 Rules

- kill(n) = {v|v ∈ def(n)}
- gen(n) = {v|v ∈ def(n) ∧ ((ref(n) ∩ in(n) ≠ ∅) ∨ (inSlice(n) = T))}
- in(n) = $U_{p \in pre(n)}$ out(p)
- out(n) = gen(n) ∪ (in(n)\kill(n))

1.2 Steps

1. Create a table with the def, ref and kill set.
2. At the beginning the in set is an empty set.
3. Start at the slicing criterion c. The line of the criterion is in the slice. Therefore inSlice(c) = T.
4. Generate the def set of the slicing criterion.
5. Calculate the gen and out sets.
6. Iterate as long as the in or out set changes.

1.3 Examples

1. Solution to the **Example *** from the lecture slides **04 ForwardSlicing**.
   Slicing Criterion is line 3.

Nr	Def	Ref	Gen	Kill	In	Out	inSlice
2.	b	∅	∅	b	∅	∅	F
3.	a	∅	a	a	∅	a	T
4.	∅	a, x	∅	∅	a, b	a, b	T
6.	b	∅	b	b	a, b	a, b	T
7.	a	∅	a	a	a, b	a, b	T
10.	z	b	z	z	a, b	a, b, z	T

Tabelle 1: Forward Slice: $Slice = \{3, 4, 6, 7, 10\} \rightarrow$ *first, second*

2. Solution to the **Example 1** from the lecture slides **04 ForwardSlicing**.
   Slicing Criterion is line 3.

Nr	Def	Ref	Gen	Kill	In	Out	inSlice
2.	r	∅	∅	r	∅	∅	F
3.	i	∅	i	i	∅	i	T
4.	∅	i, x	∅	∅	i, r	i, r	T
6.	r	r, y	r	r	i, r	i, r	T
7.	i	i	i	i	i, r	i, r	T
10.	/	/	/	/	i, r	i, r	F

Tabelle 2: Forward Slice: $Slice = \{3, 4, 6, 7\} \rightarrow$ *first, second*

3. Solution to the **Example 1** from the lecture slides **04 ForwardSlicing**. Slicing Criterion is line 2.

Nr	Def	Ref	Gen	Kill	In	Out	inSlice
2.	r	∅	r	r	∅	r	T
3.	i	∅	∅	i	r	r	F
4.	∅	i, x	∅	∅	r	r	F
6.	r	r, y	r	r	r	r	T
7.	i	i	∅	i	r	r	F
10.	/	/	/	/	r	r	F

Tabelle 3: Forward Slice: $Slice = \{2, 6\} \rightarrow$ *first*

2 FPA for Backward Slicing

2.1 Rules

- kill(n) = {v|v ∈ def(n)}
- gen(n) = {v|v ∈ ref(n) ∧ ((def(n) ∩ in(n) ≠ ∅) ∨ (inSlice(n) = T))}
- in(n) = $U_{p \in succ(c)}$ out(p)
- out(n) = gen(n) ∪ (in(n)\kill(n))

2.2 Steps

1. Create a table with the def, ref and kill set.
2. At the beginning the in set is an empty set.
3. Start at the slicing criterion c and generate the relevant variable r. The line of the criterion is in the slice. Therefore inSlice(c) = T.
4. Generate the def set of the slicing criterion.
5. Calculate the gen and out sets.
6. Iterate as long as the in or out set changes.

2.3 Examples

1. Solution to the **Example 1** from the lecture slides **04 ForwardSlicing**.
   Slicing Criterion is (10, r).

Nr	Def	Ref	Gen	Kill	In	Out	inSlice
2.	r	∅	∅	r	r, x, y	x, y	T
3.	i	∅	∅	i	i, r, x, y	r, x, y	T
4.	∅	i, x	i, x	∅	r, i, x, y	r, i, x, y	T
6.	r	r, y	r, y	r	r, i, x, y	r, y, i, x	T
7.	i	i	i	i	r, i, x, y	r, i, x, y	T
10.	/	/	r	/	∅	r	T

Tabelle 4: Backward Slice: $Slice = \{2, 3, 4, 6, 7, 10\} \rightarrow$ *first, second*

2. Solution to the **Example 1** from the lecture slides **04 ForwardSlicing**.
   Slicing Criterion is (10, i).

Nr	Def	Ref	Gen	Kill	In	Out	inSlice
2.	r	∅	∅	r	x	x	F
3.	i	∅	∅	i	i, x	x	T
4.	∅	i, x	i, x	∅	i, x	i, x	T
6.	r	r, y	∅	r	i, x	i, x	F
7.	i	i	i	i	i, x	i, x	T
10.	/	/	i	/	∅	i	T

Tabelle 5: Backward Slice: $Slice = \{3, 4, 7, 10\} \rightarrow$ *first, second*