
Anwendung: Partielle Redundanzelimination

Busy Code Motion (BCM) für...

- knotenbenannte Einzelanweisungsgraphen (kEA)
- knotenbenannte Basisblockgraphen (kBB)

Synonyme

- *UpSafety*: Availability
- *DownSafety*: Very Busyness, Anticipability

Busy Code Motion: kEA_BCM (1)

BCM for Node-labeled SI-Graphs:

1. The Up-Safety and Down-Safety Analyses

Local Predicates:

- $COMP_\iota(t)$: ι computes t .
- $TRANSP_\iota(t)$: ι does not modify an operand of t .

Busy Code Motion: kEA_BCM (2)

The Up-Safety Equation System:

$$N\text{-USAFE}_\iota = \begin{cases} false & \text{if } \iota = s \\ \prod_{\tilde{\iota} \in pred(\iota)} X\text{-USAFE}_{\tilde{\iota}} & \text{otherwise} \end{cases}$$
$$X\text{-USAFE}_\iota = (N\text{-USAFE}_\iota + COMP_\iota) \cdot TRANSP_\iota$$

Busy Code Motion: kEA_BCM (3)

The Down-Safety Equation System:

$$N\text{-DSAFE}_\iota = COMP_\iota + X\text{-DSAFE}_\iota \cdot TRANSP_\iota$$

$$X\text{-DSAFE}_\iota = \begin{cases} false & \text{if } \iota = e \\ \prod_{\tilde{\iota} \in succ(\iota)} N\text{-DSAFE}_{\tilde{\iota}} & \text{otherwise} \end{cases}$$

Busy Code Motion: kEA_BCM (4)

2. The Transformation: Insertion and Replacement Points

Local Predicates:

- $N\text{-USAFE}^*$, $X\text{-USAFE}^*$, $N\text{-DSAFE}^*$, $X\text{-DSAFE}^*$: greatest solutions of the down-safety and up-safety equation systems of step 1.

$$N\text{-INSERT}_\iota^{\text{BCM}} =_{df} N\text{-DSAFE}_\iota^* \cdot \prod_{\tilde{\iota} \in pred(\iota)} (\overline{X\text{-USAFE}_\tilde{\iota}^* + X\text{-DSAFE}_\tilde{\iota}^*})$$

$$X\text{-INSERT}_\iota^{\text{BCM}} =_{df} X\text{-DSAFE}_\iota^* \cdot \overline{TRANSP_\iota}$$

$$\text{REPLACE}_\iota^{\text{BCM}} =_{df} COMP_\iota$$

Busy Code Motion: kBB_BCM (1)

BCM für knotenbenannte BB-Graphen:

1. The Up-Safety and Down-Safety Analyses

Local Predicates:

- $BB\text{-NCOMP}_\beta(t)$: β contains an instruction ι computing t , which is not preceded by an instruction modifying an operand of t .
- $BB\text{-XCOMP}_\beta(t)$: β contains an instruction ι computing t , and neither ι nor any instruction of β following ι modifies an operand of t .
- $BB\text{-TRANSP}_\beta(t)$: β contains no instruction modifying an operand of t .

Busy Code Motion: kBB_BCM (2)

The Up-Safety Equation System:

$$BB\text{-N-USAFE}_\beta = \begin{cases} false & \text{if } \beta = s \\ \prod_{\tilde{\beta} \in pred(\beta)} (BB\text{-XCOMP}_\tilde{\beta} + BB\text{-X-USAFE}_\tilde{\beta}) & \text{otherwise} \end{cases}$$

$$BB\text{-X-USAFE}_\beta = (BB\text{-N-USAFE}_\beta + BB\text{-NCOMP}_\beta) \cdot BB\text{-TRANSP}_\beta$$

Busy Code Motion: kBB_BCM (3)

The Down-Safety Equation System:

$$BB-N-DSAFE_{\beta} = BB-NCOMP_{\beta} + BB-X-DSAFE_{\beta} \cdot BB-TRANSP_{\beta}$$

$$BB-X-DSAFE_{\beta} = BB-XCOMP_{\beta} + \begin{cases} false & \text{if } \beta = e \\ \prod_{\beta \in succ(\beta)} BB-N-DSAFE_{\beta} & \text{otherwise} \end{cases}$$

Busy Code Motion: kBB_BCM (4)

2. The Transformation: Insertion and Replacement Points

Local Predicates:

- $BB-N-USAFE^*$, $BB-X-USAFE^*$, $BB-N-DSAFE^*$, $BB-X-DSAFE^*$: greatest solutions of the up-safety and down-safety equation systems of step 1.

$$N-INSERT_{\beta}^{BCM} =_{df} BB-N-DSAFE_{\beta}^* \cdot \prod_{\beta \in pred(\beta)} (BB-X-USAFE_{\beta}^* + BB-X-DSAFE_{\beta}^*)$$

$$X-INSERT_{\beta}^{BCM} =_{df} BB-X-DSAFE_{\beta}^* \cdot BB-TRANSP_{\beta}$$

$$N-REPLACE_{\beta}^{BCM} =_{df} BB-NCOMP_{\beta}$$

$$X-REPLACE_{\beta}^{BCM} =_{df} BB-XCOMP_{\beta}$$

Sparse Code Motion

...platzsensitive partielle Redundanzelimination:

Anhand von Vorlesungsteil 7!

Vorschau: Letzter Vorlesungstermin...

- Di, 30.01.2007, Vorlesung von 17:45 Uhr bis 19:15 Uhr, Bibliothek E185/1