
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:

- $\text{COMP}_\iota(t)$: ι computes t .
- $\text{TRANSP}_\iota(t)$: ι does not modify an operand of t .

Busy Code Motion: kEA_BCM (2)

The Up-Safety Equation System:

$$\text{N-USAFE}_\iota = \begin{cases} \textit{false} & \text{if } \iota = s \\ \prod_{\hat{\iota} \in \textit{pred}(\iota)} \text{X-USAFE}_{\hat{\iota}} & \text{otherwise} \end{cases}$$

$$\text{X-USAFE}_\iota = (\text{N-USAFE}_\iota + \mathbf{COMP}_\iota) \cdot \mathbf{TRANSP}_\iota$$

Busy Code Motion: kEA_BCM (3)

The Down-Safety Equation System:

$$\text{N-DSAFE}_\iota = \text{COMP}_\iota + \text{X-DSAFE}_\iota \cdot \text{TRANSP}_\iota$$

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

Busy Code Motion: kEA_BCM (4)

2. The Transformation: Insertion and Replacement Points

Local Predicates:

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

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

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

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

Busy Code Motion: kBB_BCM (1)

BCM für knotenbenannte BB-Graphen:

1. The Up-Safety and Down-Safety Analyses

Local Predicates:

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

Busy Code Motion: kBB_BCM (2)

The Up-Safety Equation System:

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

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

Busy Code Motion: kBB_BCM (3)

The Down-Safety Equation System:

$$\text{BB-N-DSAFE}_\beta = \text{BB-N-COMP}_\beta + \text{BB-X-DSAFE}_\beta \cdot \text{BB-TRANSP}_\beta$$

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

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.

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

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

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

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

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