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Abstract - Topic 10: Purple Dragon book - Chapter 9.7 (Region-Based Analysis)

The iterative data-flow analysis algorithm, it is just one approach to solving data-flow problems. In our lecture notes document, we discuss another approach called *region-based analysis*. In the iterative-analysis approach, we create transfer functions for basic blocks and then we find the fixedpoint solution by repeated passes over the blocks. Instead of creating transfer functions just for individual blocks, a region-based analysis finds transfer functions that summarize the execution of progressively larger regions of the program. Ultimately, transfer functions for entire procedures are constructed, and then applied, to get the desired data-flow values directly.

A region-based analysis is particularly useful for data-flow problems, where paths that have cycles may change the data-flow values. The closure operator allows the effect of a loop to be summarized. The technique is also useful for interprocedural analysis, where transfer functions associated with a procedure call may be treated like the transfer functions associated with basic blocks.

For simplicity, we will use only forward data-flow problems in this lecture notes. We will illustrate how region-based analysis works by using the familiar example of reaching definitions. In our lecture notes we will present base concept of this issue.