

ASSIGNMENT 4

Abstract Interpretation

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INTRODUCTION:

The primary objective of this assignment is to employ the principles of Abstract Interpretation to monitor Kachua's movements throughout a program and determine the final potential range of coordinates where Kachua rests. Additionally, the challenge involves avoiding a region known as "Magarmach's," defined by two sets of "x" and "y" coordinates forming a rectangle. The overarching goal is to confirm that Kachua never occupies the Magarmach's area.

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Abstract Interpretation Overview:

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Tracked Parameters:

The following parameters are tracked throughout the program: The x-coordinate position of Kachua The y-coordinate position of Kachua The direction of Kachua ['left', 'right', 'bottom', 'up'] Variables from 'a' to 'z'

Initialization:

Initialization begins with setting the "In" of the single statement basic block at the start node. The x- and y-ranges are initialized to [0,0], and Kachua faces the conventional '+r' direction initially. Variable initial values are assumed to be in the range of [-300,300].

Transfer Function

The transfer function calculates the 'OUT' of blocks using the 'in' values. Operations covered by the transfer function include Assignment Command, Forward, Backward, Left, Right, and Conditional Operators.

Meet Function

The Meet Function combines multiple 'outs' of basic blocks into 'ins' for a specific basic block. It takes into account the ranges of x-coordinates and ensures that directions align for accurate interpretation.

Conclusion

Despite the limitations, this Abstract Interpretation approach provides a foundational framework for monitoring Kachua's movements and ensuring its safety, with room for further refinement and expansion.