

Table 1: Simulink mutation operators that cannot be used in BERTiMuS, along with the reasons why these operators cannot be automated using BERTiMuS

Mutation ID	Mutation operators	Corresponding reasons	References
1	Insert absolute value operator	BERTiMuS cannot insert blocks.	[2]
2	Disable or create connections between blocks.	BERTiMuS only performs mutations inside blocks.	[1]
3	Statement Swap Operator	BERTiMuS only performs mutations inside blocks individually. Thus, it cannot operate on multiple blocks.	[3]
4	Scalar variable for array reference replacement	BERTiMuS can only replace a scalar with a scalar or an array with an array.	[2]
5	Block Removal Operator	BERTiMuS only performs mutations inside the blocks. Thus cannot remove a whole block.	[3]

References

- [1] Ezio Bartocci, Leonardo Mariani, Dejan Ničković, and Drishti Yadav. Fim: fault injection and mutation for simulink. In *Proceedings of the 30th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering*, pages 1716–1720, 2022.
- [2] Yue Jia and Mark Harman. An analysis and survey of the development of mutation testing. *IEEE transactions on software engineering*, 37(5):649–678, 2010.
- [3] Khuat Thanh Le Thi My Hanh and Nguyen Thanh Binh Tung. Mutation-based test data generation for simulink models using genetic algorithm and simulated annealing. *International Journal of Computer and Information Technology*, 3(04):763–771, 2014.