Reactive Synthesis

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- The **verification problem** is: given system M and spec/property φ, check that $M \vDash \varphi$.
- The **synthesis problem** is: given spec φ synthesize M such that $M \vDash \varphi$.

The *deductive approach* [Manna and Waldinger, 1980] tries to synthesize an input/output program by extracting it from a realizability proof.

Temporal synthesis considers specifications given in the form of LTL, for example. Initial approach was to use satisfiability of a temporal formula as a way to derive M [Clarke and Emerson, 1982]. See also [Manna and Wolper, 1984].

References

[Clarke and Emerson, 1982] Clarke, E. M. and Emerson, E. A. (1982). Design and synthesis of synchronization skeletons using branching time temporal logic. In Kozen, D., editor, *Logics of Programs*, pages 52–71, Berlin, Heidelberg. Springer Berlin Heidelberg.

[Manna and Waldinger, 1980] Manna, Z. and Waldinger, R. (1980). A deductive approach to program synthesis. *ACM Transactions on Programming Languages and Systems (TOPLAS)*, 2(1):90–121.

[Manna and Wolper, 1984] Manna, Z. and Wolper, P. (1984). Synthesis of Communicating Processes from Temporal Logic Specifications. *ACM Trans. Program. Lang. Syst.*, 6(1):68–93.