SST – comments to tasks

Task 1. Design the circuit of a, b inputs and w, z outputs working according to the given time diagram.

We create the SST according to the general rules. It's however worth noting that after the a+ change in (cycle 2) both outputs should change their states to 1 (w+, z+). In SST two or more signals can't change at the same time. Creating the SST we need to make an arbitrary decision which of these signals will change first. Here we have w+ first (cycle 3), z+ later (cycle 4).

In the created SST we see only the single contradictory numerical state (cycles 7 and 11, NCS=8). In this SST it's easy to place the borders. They can be placed directly after before 7 and 11 cycles. It causes the addition of a single auxiliary argument – d. Repeated NCS calculation with respect to d shows that there are no repetitions in the SST – there are no contradictory repetitions, either. The SST is therefore solvable.

It's worth recalling that our goal is not to avoid repetitions, but to eliminate contradictory repetitions.

Basing on the solvable SST we create the canonical forms of the output and auxiliary functions.

Task 1. Design the circuit of a, b inputs and w output working according to the given time diagram.

The task seems simple. After creating the SST it shows however that there are numerous contradictory repetitions: cycles 4 and 6 (NCS=3), cycles 1, 3 and 7 (NCS=1) and some not contradictory: cycles 0 and 2 (NCS=0). Placing the border after cycle 5 (NCS=2) is not a bad idea, but still insufficient to make the SST solvable.

The border placement rules are as follow:

- the border can't be placed right after the cycle with NCS contradictory to a cycle after the border
- the border can't be placed right after the cycle with NCS not contradictory to a cycle before the border (except when the cycles of this NCS always end this SST zone).

It seems therefore, that the SST can't be solved. We can however place the borders after the 0 and 2 cycles (NCS=3) and 1 (NCS=1). This way, using also the border after the cycle 2, we distribute the contradictory states to separate SST zones. There are 4 borders and 2 auxiliary variables. Couldn't we decrease this number? It could be possible, if α and γ, as well as β and δ, contain no contradictions. While the pair of β and δ makes no contradictions (in both parts NCS=1 exists but no contradictory), the pair of α and γ does (in α part NCS=1 exists for w=0 (cycle 1), in γ part – for w=1 (cycle 3)); α and γ parts can't be therefore joined. Thus, there is no point to join β and δ, because we would still need 2 auxiliary variables (in our example – d and e).

After considering these auxiliary variables and insertion of additional cycles, SST contains no contradictions, so it contains no contradictory repetitions – it's therefore solvable. Further procedure is standard: writing of output and auxiliary functions canonical forms, Karnaugh map creation, expression definition for implementation using gates or flip-flops.