Секция 1. Информационные технологии, автоматизация, системы управления.

ALGEBRAIC LOOP RESOLUTION ALGORITHM IN DYNAMIC SYSTEMS CALCULATION

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Basically, in dynamic systems algebraic loops occur when an input port with direct feedthrough is driven by the output of the same block, either directly, or by a feedback path through other blocks which have direct feedthrough.
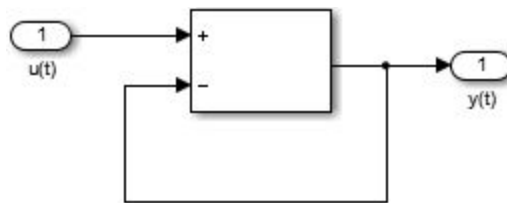

Fig. 1 The simplest algebraic loop.

Mathematically, this loop implies that the output of the Sum block is an algebraic state z constrained to equal the first input u minus z (i.e. $z = u - z$). The solution of this simple loop is $z = u/2$, but most algebraic loops cannot be solved by inspection [1, 2].

When a model contains an algebraic loop, it is necessary to call a loop solving routine at each time step. The loop solver performs iterations to determine the solution to the problem (if it can). As a result, models with algebraic loops run slower than models without them [3].

The main goal of this paper was to develop an algorithm in a dynamic system releasing algebraic loop. The algorithm analyzes the blocks that make up a dynamic system and highlights the algebraic loop. In this addition to finding algebraic loops, the algorithm allows us to find the procedure for calculating the blocks to obtain adequate results. The paper presents a block diagram of the algorithm description. The algorithm is verified by the example of a dynamic system comprising a plurality of algebraic loops.

REFERENCES

1. Using Simulink. URL: http://www.itu.dk/stud/speciale/segmentering/Matlab6p5/help/toolbox/simulink/ug/how_simulink_works15.html (visit date: 28.08.2014).

2. Simulink User's Guide. URL: http://www.mathworks.com/help/pdf_doc/simulink/sl_using.pdf (visit date: 28.08.2014).

3. Mathworks. URL: http://www.mathworks.com/help/simulink/ug/simulating-dynamic-systems.html (visit date: 28.08.2014).