

MEASURING CAUSE AND EFFECT OF PROCESS VARIABLESMargret Bauer^x, John W. Cox[†] and Nina F. Thornhill^x^xUniversity College London[†]Eastman Chemical Company*Abstract*

Disturbances in chemical processes spreading through plants affect a number of process variables. The operator or the monitoring scheme in place often detects the disturbance at a variable critical to the process. This variable might not be close to the actual cause and isolation of the root cause becomes therefore a task for the control engineer.

The aim of the proposed paper is to find ways of identifying cause and effect and thus the direction of propagation of a disturbance using only historical data of the process variables. A recently introduced method, predictability improvement (PI), is based on embedded vectors and finding their nearest neighbors. The modified PI algorithm works by exploiting, firstly, time delays which often occur between two measuring points and, secondly, attenuation of the signature of the disturbance related to the distance of the root cause.

A new case study of an industrial distillation process at Eastman Chemical Company will be introduced (Figure 1). The modified PI method will be applied to a disturbance most strongly observed by the operators at level controller LC1. Applying PI to temperature measurements TI1 to TI5, TI6 and TI7 should reveal that the disturbance originates from a root cause further upstream.

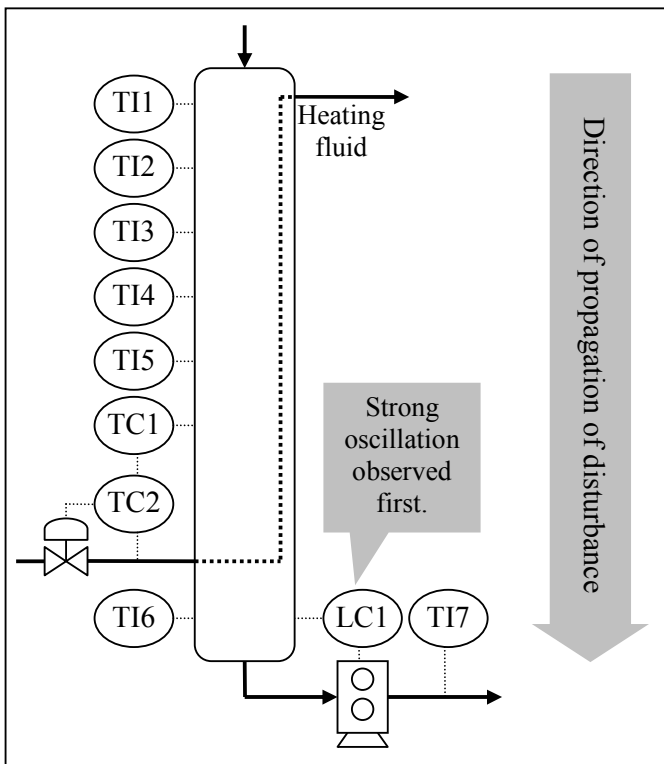


Figure 1. Process schematic of industrial case study.