Claims

1. Computer-implemented method (402) for obtaining parameters (550) to be used by a control module (604) of a computer (600), wherein the control module (604) is adapted to control technical equipment (110) by processing batch-run data (504) from the technical equipment (110), the method (402) comprising:

receiving (410), from technical equipment (110) that has performed a production process, a reference plurality (502) of multi-variate reference time-series (510-e), wherein the multi-variate reference time-series (510-e) are based on time points (t_k) of a batch-specific batch-run time interval ([t_1, t_K]) and comprises data values from sources (120-1, 120-2, 120-5) that are related to the technical equipment (110), wherein each multi-variate reference time-series (510-e) comprises

a first time-series (511-e) from a first source (120-1), with data for first measurement values,

a second time-series (512-e) from a second source (120-1), with data for second measurement values, and

a third time-series (515-e) from a third source (120-5), with data describing particular manufacturing operations during the batch-run time interval ([t_1, t_K]);

for each multi-variate reference time-series (510-e) of the plurality separately: splitting (420) the batch-run time interval ([t_1, t_K]) into phases (p), the phases (p) being consecutive time intervals ([t_1, t_N]p), by determining transitions between the particular manufacturing operations, and dividing (430) the first time-series (511-e) into particular phase-specific first partial series (511-1e, 511-2e) and the second time-series (512) into particular phase-specific second partial series (512-1e, 512-2e);

for each phase (p) separately, and for the phase-specific partial series in combination, processing (440) the phase-specific partial series to differentiate the plurality-related phase-specific time-series into relevant partial time-series (1) or non-relevant partial time-series (0) according to relevance rules,

wherein processing (440) to differentiate is executed by evaluating any of the following relevance rules, using: magnitude of data values within a pre-defined threshold band, relation of data values to the standard deviation of the normal distribution, signal-to-noise ratio, Dynamic Time Warping (DTW) distances, identification of time-series that are correlated, and the identification of outliers in disturbed time-series; and

storing (450) the relevance information as the parameters (550),

wherein storing (450) the relevance information is executed by providing a parameter matrix (Φ) , whose rows relate to particular sources v, and whose columns relate to particular

phases p, with binary elements that selectively allow or block the control module (604) of the computer (600) to process the batch-run data from the technical equipment (110)

wherein an element “0” of the parameter matrix (Φ) indicates data to be processed, and an element “1” of the parameter matrix (Φ) indicates data to disregard,

the method (402) further comprising:

receiving (470) a plurality (503) of further multi-variate time-series, from batch-runs for that the quality indicators are already available;

providing (475) a set of parameter variations (550-var-0, 550-var-1, 550-var-2) of the parameter matrix (Φ) by toggling parameters that allow (1) to elements that block (0); for each parameter variation, and for each further multi-variate time-series, obtaining

(480) quality indicators by processing the multi-variate time-series;

determining (485) differences of the obtained quality indicators and taking the variation (550-var-1) for that the differences are minimal as selected parameters (550').

2. Method (402) according to claim 1,

wherein step receiving (410) is executed for multi-variate reference time-series (510-e) pre-selected from a collection (501) of multi-variate historic time-series, with data from historic batch-runs.

3. Method (402) according to any of the preceding claims,

wherein receiving (410) is executed for the plurality of multi-variate reference time-series (510-e) that has been pre-selected from a collection (501) of multi-variate time-series from historic batch-runs (H), with the criterion to select multi-variate time-series from historic batch-runs that conform to a particular target quality indicator.

4. Method (402) according to any of the preceding claims, wherein splitting (420) is performed by determining the transition between the phases (p) according to time-points of event descriptors (520-e) that belong to the data of the third time-series (515-e).

5. Method (402, 403) according to claim 4,

wherein receiving (470) comprises receiving further multi-variate time-series from batch-runs for that the quality indicators indicate the same quality.

6. Method (402, 403) according to any of claims 1–5, further comprising

the control module (604) aggregating data from a particular interaction-time batch-run (504) of the technical equipment (110) into a status indicator of the technical equipment (110),

wherein the interaction-time batch-run (504) is a current batch-run or a historic batch-run; and

wherein the control module (604) uses the parameters (550) to selectively filter out the data according to particular sources and particular phases prior to aggregation.

7. A computer system (600) adapted to execute the method (402, 403) according to any of claims 1–6.

8. A computer program product that, when loaded into a memory of a computer and being executed by at least one processor of the computer, performs the steps of the computer-implemented method according to any of claims 1–6.

9. A method comprising: using the parameters (550) obtained by executing the computer-implemented method according to any of claims 1–5 by a control module (604) that aggregates data from a particular interaction-time batch-run (504) of the technical equipment (110) into a status indicator of the technical equipment (110), wherein the interaction-time batch-run (504) is a current batch-run or a historic batch-run; and
wherein the control module (604) uses the parameters (550) to selectively filter out the data according to particular sources and particular phases prior to aggregation.

10. Computer-implemented method (404) being a control method to identify a quality indicator for a particular batch-run, the method (404) with reading the parameters (550) as a result of executing the method according to any of claims 1–5, filtering data according to the parameters (550) that are source-specific and that are phase-specific, and aggregating the data.

11. The method according to claim 10, further comprising the step of:
after aggregating the data, deriving the quality indicator for each source (120-1, 120-2, 120-5) and/or each phase (p).