Discovering Life Cycle Assessment Trees from Impact Factor Databases
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Abstract

In recent years, environmental sustainability has received widespread attention due to continued depletion of natural resources and degradation of the environment. Life cycle assessment (LCA) is a methodology for quantifying multiple environmental impacts of a product, across its entire life cycle — from creation to use to discard. The key object of interest in LCA is the inventory tree, with the desired product as the root node and the materials and processes used across its life cycle as the children. The total impact of the parent in any environmental category is a linear combination of the impacts of the children in that category. LCA has generally been used in "forward" mode: given an inventory tree and impact factors of its children, the task is to compute the impact factors of the root, i.e., the product being modeled. We propose a data mining approach to solve the inverse problem, where the task is to infer inventory trees from a database of environmental factors. This is an important problem with applications in not just understanding what parts and processes constitute a product but also in designing and developing more sustainable alternatives. Our solution methodology is one of feature selection but set in the context of a non-negative least squares problem. It organizes numerous non-negative least squares fits over the impact factor database into a set of pairwise membership relations which are then summarized into candidate trees in turn yielding a consensus tree. We demonstrate the applicability of our approach over real LCA datasets obtained from a large computer manufacturer.

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Life cycle assessment (LCA) is a methodology for quantifying multiple environmental impacts of a product, across its entire life cycle — from creation to use to discard. In such cases, discovering the LCA trees could determine whether the disclosures are reasonable; (2) Sustainable re-design: it is usually too expensive and timeconsuming for a supplier to estimate the impact of a product (parent) based on all its children, so a node in the impacts database approximately equivalent to the parent (root) is selected and the footprint computed without knowledge of. Impact Factor Database: Nodes Impact factors NNLS Fits: i Root 271: Copper Carbonate j … Life cycle analysis as applied to solid waste manage-ment systems is a technique for assessing cradle-to-grave environmental impacts associated with production, use, and discard of products and materials in our society. The methodology used in this study takes into consideration a broad range of environmental impact factors. These have been consolidated under three major categories: 1. Climate Change (e.g., greenhouse gases such as carbon dioxide, methane, nitrous oxide and chlorofluorocarbons), 2. Human Health (e.g., pollutants causing cancer, respira-tory ailments and toxicity such as partic Life Cycle Impact Assessment — a study of the EPS method for use within SCA JENNY MATTSSON © JENNY MATTSSON, 2012 Examiner: ANNE-MARIE TILLMAN Supervisor: CHRISTIN LIPTOW Supervisor at SCA Global Hygiene Category: ELLEN RIISE Diploma thesis 2011- 2012: Department of Energy and Environment Division of Environmental System Analysis Chalmers University of Technology SE – 412 96 Göteborg Sweden Telephone: + 46 (0)31 – 772. Appendix III - Differences in characterization factors between report and database Life cycle impact assessment is one of the steps when performing an LCA. Its purpose is to investigate the extent to which flows in the life cycle affects the environment and how.