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Improving workforce scheduling using artificial neural networks model

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ABSTRACT

This paper demonstrates a decision support tool for workforce planning and scheduling. The research conducted in this study is oriented on batch type production typical for smaller production systems, workshops and service systems. The derived model in the research is based on historical data from Public utility service billing company. Model uses Artificial Neural Networks (ANN) fitting techniques. A set of eight input indicators is designed and two variants were tested in the model with two different outputs. Several comprehensive parameter setting experiments were performed to improve prediction performances. Real case studies using historic data from public weather database and communal consolidated billing service show that it is difficult to predict the required number of servers-workers in front office. In a similar way, this model is adequate for complex production systems with unpredictable and volatile demand. Therefore, manufacturing systems which create short cycle products, typical for food processing industry, or production for inventory, may benefit of the research presented in this paper. ANN simulation model with its unique set of features and chosen set of training parameters illustrate that presented model may serve as a valuable decision support system in workforce scheduling for service and production systems.

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Izvirni znanstveni članek

Izboljšanje razporejanja delovne sile z modelom umetnih nevronskih mrež

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POVZETEK

Prispevek predlaga orodje za podporo pri načrtovanju in razporejanju delovne sile. Raziskava, opravljena v tej študiji, je usmerjena na serijsko proizvodnjo, značilno za manjše proizvodne obrate, delavnice in storitvena podjetja. Izpeljani model temelji na podatkih družbe za obračunavanje komunalnih storitev in tehniki umetnih nevronskih mrež (ANN). Zasnovan model ima osem vhodnih indikatorjev ter dve različici z dvema različnima izhodoma. Za izboljšanje napovedovanja smo izvedli več obsežnih poskusov nastavljanja parametrov. Realne študije primerov, ki uporabljajo podatke iz javne vremenske baze in podjetja za obračunavanje komunalnih storitev kažejo, da je težko napovedati število zaposlenih v operativni pisarni. Predlagan pristop je v osnovi primeren tudi za kompleksne proizvodne sisteme z nepredvidljivim in nestanovitnim povpraševanjem. Zato lahko rezultati predstavljeni v tej raziskavi koristijo proizvodnim podjetjem, ki izdelujejo izdelke v kratkem ciklu, značilnem za živilsko predelovalno industrijo ali proizvodnjo na zaloge. Simulacijski model ANN s posebnim naborom značilnosti in parametri za učenje je pokazal, da lahko predstavljeni model služi kot dragoceno orodje pri načrtovanju razporeda delovne sile v storitvenem in proizvodnem sektorju.

PODATKI O ČLANKU

Ključne besede:
Razporejanje delovne sile
Načrtovanje proizvodnje
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