Simulation-based time evaluation of basic manual assembly tasks

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ABSTRACT

The paper presents a simple simulation model of the lifting procedure that can be used to predict the total time required for the sequence of basic manual assembly tasks depending on the various parameters of the load and with regard to the workers' health. The aim of the research is to determine the appropriateness of using simulation tool for (re)setting time standards for manual assembly tasks. An avatar in the simulation model performs sequences of tasks with a handling mass of up to 20.5 kg. The individual times obtained from the simulation model were analysed and compared with several time prediction methods and validated in laboratory environment. An analysis of the influence of different load parameters on the total time was also performed. Dependency is mostly linear, so from the practitioner point of view, we can predict with reasonable certainty the total time for any sequence of manual assembly tasks for every size and mass of the box. Based on the results we can confirm that simulation tool JACK is suitable not only for ergonomic analyses but also for setting time standards for the workers. Furthermore, with the simulation tool we analyse the process and get the accurate results in shorter time compared to other mentioned methods.

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Simulacijsko podprto vrednotenje časa izvedbe osnovnih nalog pri ročni montaži

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POVZETEK

V prispevku je predstavljen preprost simulacijski model postopka dvigovanja. S pomočjo simulacijskega modela je mogoče predvideti skupni čas, potreben za izvedbo zaporedja osnovnih nalog pri ročni montaži, v odvisnosti od različnih parametrov obremenitve in ob upoštevanju zdravja delavcev. Cilj raziskave je ugotoviti primernost uporabe simulacijskega orodja za določanje (oz. ponovno določanje) časovnih standardov za ročno montažo. Avatar v simulacijskem modelu izvaja zaporedja nalog, pri katerih upravlja predmete z maso do 20,5 kg. Posamezne čase, pridobljene s simulacijskim modelom, smo analizirali in primerjali z več metodami časovnega napovedovanja ter potrdili v laboratorijskem okolju. Opravljena je bila tudi analiza vpliva različnih parametrov obremenitve na skupni čas. Odvisnost je večinoma linearna, zato lahko z vidika delavca z razumno gotovostjo predvidimo skupni čas za izvedbo katerega koli zaporedja nalog ročne montaže za vsako velikost in maso škatle. Na podlagi rezultatov lahko potrdimo, da je simulacijsko orodje JACK primerno ne samo za ergonomske analize, temveč tudi za določanje časovnih standardov za delavce. Poleg tega lahko s simulacijskim orodjem analiziramo postopek in dobimo natančne rezultate v krajšem času v primerjavi z drugimi omenjenimi metodami.

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PODATKI O ČLANKU

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Analiza časa;
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