A distributed-telemanufacturing model for final-product realization

by

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Keywords: Telemanufacturing, distributed manufacturing, telemanufacturing agents.

The principal aim of this thesis is to create and expound a distributed-telemanufacturing model (“DTMF” model, for short) that can be used for final-product realization, with “telemanufacturing” being the remote application of a layered-manufacturing machine and its software to create a model or product. It is envisaged (at no distant date) that machines will be made to be exponentially more accurate and that they will even be able to “create” models or products from a host of different materials and elements. The model to be expounded in the present thesis will, therefore, serve to address problems and issues relevant to such service, which service will, ultimately, be rendered mutually by businesses and – in the e-commerce scenario – by businesses to their customers.

The DTMF model comprises an interface, a processing server, a locating agent and a manufacturing resource, with the interface being the overview that the user will have of the telemanufacturing process and the extent to which he/she will be able interactively to submit and glean information on and from a submission. The processing server, in its turn, prepares the submission in such a way as to allow its direct submission to a manufacturing resource, which resource consists of either a layered-manufacturing machine or any digital-input machine. The processing server, therefore, ensures that the submitted design be in the correct format to be interpreted by the manufacturing machine. The locating agent then takes the processed design and locates an appropriate manufacturing resource that matches the user’s specifications and meets the requirements of the processed design. On having received the processed design, the locating agent submits it to a queue at the manufacturing resource. The manufacturing resource is, therefore, controlled by the locating agent in that the locating agent calls up the

available manufacturing methods through a web service at each machine.

Next, the DTMF model is extended also to allow the use of a design repository, where a design can be searched for and retrieved. This enables a user to produce products on demand by retrieving a stored design and by applying customization, if necessary.

The DTMF model, therefore, makes possible not only on-demand manufacturing for current machines but also music of the future, such as final-product realization.

Sleutelwoorde: Televervaardiging, verspreide vervaardiging, agente vir televervaardiging.

Die hoofdoel van hierdie proefskrif is om ’n verspreidetelevervaardiging-model (kortweg die “DTMF-model” genoem) te skep en uiteen te sit wat vir finaleproduk-realisering aangewend kan word, met “televervaardiging” synde die afstandsaanwending (“remote application”) van ’n laag-op-laag-vervaardigingsmasjien (“layered-manufacturing machine”) en sy sagteware om ’n model of produk te vervaardig. Daar word tans in die vooruitsig gestel dat masjiene (binne afsienbare tyd) eksponensieel meer akkuraat gemaak gaan word en dat masjiene selfs in staat sal wees om modelle of produkte uit ’n duisternis verskillende materiale en grondstowwe te “skep”. Die model wat in die onderhawige proefskrif uiteengesit gaan word, sal gevolglik gebruik word om probleme en kwessies rakende sodanige diens aan te pak, welke diens uiteindelik deur ondernemings onderling en – in die e-handelscenario – deur ondernemings aan hul klante gelewer sal word.

Die DTMF-model bestaan uit ’n koppelvlak, ’n verwerkingsbediener, ’n identifiseringsagent en ’n vervaardigingshulpbron, met die koppelvlak synde die oorsig wat die gebruiker sal hê van die televervaardigingsproses en die mate waarin hy/sy in staat sal wees om op interaktiewe wyse inligting oor en van ’n voorlegging (“submission”) voor te lê en in te win. Die verwerkingsbediener berei op sy beurt die voorlegging op só ’n wyse voor dat dit regstreeks aan ’n vervaardigingshulpbron voorgelê kan word, welke hulpbron uit óf ’n laag-op-laag-vervaardigingsmasjien óf enige digitale-invoer-masjien bestaan. Die verwerkingsbediener verseker dus dat die voorgelegde ontwerp in die regte formaat is om deur die vervaardigingsmasjien geïnterpreteer te kan word. Hierna neem die identifiseringsagent die verwerkte ontwerp en identifiseer ’n gepaste vervaardigingshulpbron wat aan die gebruiker se spesifikasies en die vereistes vir die verwerkte ontwerp voldoen.

Sodra die identifiseringsagent die verwerkte ontwerp ontvang het, word dit by die vervaardigingshulpbron op ’n voorleggingswaglys geplaas. Die vervaardigingshulpbron word dus deur die identifiseringsagent beheer in soverre dat die identifiseringsagent die beskikbare vervaardigings-metodes deur middel van ’n webdiens by elke masjien oproep.

Hierna word die DTMF-model uitgebrei om ook die gebruik van ’n ontwerpbewaarplek moontlik te maak, waar daar na ’n ontwerp gesoek en dit herwin kan word. Dit stel die gebruiker in staat om produkte op aanvraag te vervaardig deur ’n gestoorde ontwerp te herwin en indien nodig, pasmaking toe te pas.

Die DTMF model maak dus nie alleen vervaardiging op aanvraag by bestaande masjiene moontlik nie maar ook toekomsmusiek soos dié van finaleproduk-realisering.

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