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# Exploitable Results by Third Parties

## SAMUEL 17010

### Project details

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Name: 3DPartFinder Geometric Search with Mesh 3D Models support

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ Mesh based 3D Models (e.g. STL) | ▪ Extraction 3DPartFinder-type geometric descriptor | ▪ Geometric Search Results<br>▪ Geometric database analytics report (HTML) |

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| Unique Selling Proposition(s): | ▪ Extraction of fully-featured 3DPartFinder geometric descriptor of mesh-based files (STL, MAGICS, MATAMX).<br>▪ Usable in conjunction with CAD models. Cross-compatible.<br>▪ Corner stone of part design reuse.<br>▪ Basis for inventory control and duplicate parts reduction. |
| Integration constraint(s): | ▪ Up-to-date Windows installation: Windows 10 and up<br>▪ 64-bit Quad Core Processor<br>▪ 8 GB RAM Memory (16 GB recommended for 3d descriptors extraction) |
| Intended user(s): | ▪ Any Users in needs of Geometric search to find similar 3D models or information related or associated to the 3D models<br>▪ Software Editors seeking Geometric search capabilities |
| Provider: | ▪ 3DSemantix |
| Contact point: | ▪ Alain Coulombe - alain.coulombe@3dsemantix.com |
| Condition(s) for reuse: | ▪ Subscriptions<br>▪ OEM Contract |

*Latest update: 2022-09-23*

Name: AM Partner Search Platform

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Models (STL, STEP, Native CAD)<br>▪ Production data in excel format or database plugin (Material, equipment used, quantity produced) | ▪ Find AM manufacturers based on production experience of targeted part to be 3D printed.<br>▪ Consult manufacturer's profile and have "at-glance" look at their production distribution (material, lot size, AM Processes.) | ▪ HTML GUI (Online platform) |

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| Unique Selling Proposition(s): | ▪ Locate Part Manufacturer based on production experience vs target part<br>▪ Customized analysis according to reference 3D Model to produce and required characteristics (material, build process). |
| Integration constraint(s): | ▪ For users using the platform:<br>o Access to internet<br>▪ For data-submitting manufacturer:<br>o See requirements for *3DPartFinder AM Data Valorisation Solution*<br>o Access to internet |
| Intended user(s): | ▪ OEM<br>▪ AM Manufacturers<br>▪ Online platform publishers seeking Experience-based Partner Search integration |
| Provider: | ▪ 3DSemantix |
| Contact point: | ▪ Alain Coulombe - alain.coulombe@3dsemantix.com |
| Condition(s) for reuse: | ▪ Subscription |

*Latest update: 2022-09-23*

Name: 3DPartFinder AM Data Valorisation Solution

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Models (STL, STEP, Native CAD, Native Magics formats)<br>▪ Production data in excel format or database plugin (Material, equipment used, quantity produced) | ▪ Geometry-based search engine.<br>▪ Presentation of related production data.<br>▪ Visualization of geometric search results 3d models directly in Materialise Magics or Third-party viewer.<br>▪ AI-based Build Time estimation.<br>▪ AI-based Build Orientation suggestions. | ▪ Desktop GUI<br>▪ Exportable search results (CSV)<br>▪ Geometric database analytics report (HTML) |

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| Unique Selling Proposition(s): | ▪ Valorisation of the company historical production data. Know-how reuse.<br>▪ Quick, efficient and cross-compatible geometric search<br>▪ Target specific data subset, specific to a use case or context (costing, process planning, etc…)<br>▪ Generate relevant and precise build time estimation for part or build platform. Returned from AI model trained on user's company's production data.<br>▪ Receive useful build orientation suggestions. Orientations calculated by AI model trained on user's company's production data. |
| Integration constraint(s): | ▪ Up-to-date Windows installation: Windows 10 and up<br>▪ 64-bit Quad Core Processor<br>▪ 8 GB RAM Memory (16 GB recommended for 3d descriptors extraction) |
| Intended user(s): | ▪ Part Designers<br>▪ RFQ Response Team<br>▪ AM Production Team |
| Provider: | ▪ 3DSemantix |
| Contact point: | ▪ Alain Coulombe - alain.coulombe@3dsemantix.com |
| Condition(s) for reuse: | ▪ Subscription |

*Latest update: 2022-09-23*

Name: AI module to predict AM Build time

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Models (STL, STEP, Native CAD)<br>▪ Production data or database plugin) | ▪ Train AI model on a set of data to predict Build time of a 3D model. | ▪ Build time estimate |

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| Unique Selling Proposition(s): | ▪ Predicts precise AM build time of individual parts or whole build platforms.<br>▪ AI model trained offline on company's own production data and 3D models geometric characteristics and geometric descriptor.<br>▪ Online, global AI model also available. |
| Integration constraint(s): | ▪ Organized, quality AM production data |
| Intended user(s): | ▪ AM Manufacturers<br>▪ Software Editors |
| Provider: | ▪ 3DSemantix |
| Contact point: | ▪ Alain Coulombe - alain.coulombe@3dsemantix.com |
| Condition(s) for reuse: | ▪ Subscription<br>▪ OEM Contract |

*Latest update: 2022-09-23*

Name: AI module to predict AM Part orientation

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Models (STL, STEP, Native CAD)<br>▪ Production data or database plugin) | ▪ Train AI model on a set of data to predict AM Part orientation of a 3D model. | ▪ 3D model suggested orientation |

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| Unique Selling Proposition(s): | ▪ Predicts part build orientation, taking into account part geometry, material, required supports, build process and more. Suggests various relevant possible orientations when appropriate.<br>▪ AI model trained offline on company's own production data and 3D models geometric characteristics and geometric descriptor.<br>▪ Online, global AI model also available. |
| Integration constraint(s): | ▪ Organized, quality AM production data |
| Intended user(s): | ▪ AM Manufacturers<br>▪ Software Editors |
| Provider: | ▪ 3DSemantix |
| Contact point: | ▪ Alain Coulombe - alain.coulombe@3dsemantix.com |
| Condition(s) for reuse: | ▪ Subscription<br>▪ OEM Contract |

*Latest update: 2022-09-23*

Name: Automatic build preparation

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Models (STL, STEP, Native CAD)<br>▪ Production data or database plugin | ▪ Train AI model on a set of data to propose build preparatory steps. | ▪ Build parameters: orientation and toolpath optimisation |

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| Unique Selling Proposition(s): | ▪ Determining the build parameters is currently a process that often involves a few iterations (trial and error). The number of iterations can be greatly reduced. This reduces cost as well as waste. |
| Integration constraint(s): | ▪ The resulting proposition will be integrated into the current Build Processor suite of Materialise (BP). |
| Intended user(s): | ▪ AM users and service bureaus<br>▪ Existing (software) customers |
| Provider: | ▪ Materialise |
| Contact point: | ▪ Michel Janssens – michel.janssens@materialise.be |
| Condition(s) for reuse: | ▪ different business models can be applied: license, pay-per-use…<br>▪ OEM Contract |
| | *Latest update: 2022-09-27* |

| Name: Build time estimation (BTE) for (high-end) FDM | | |
|---|---|---|
| Input(s): | Main feature(s) | Output(s): |
| ▪ 3D Models (STL, STEP, Native CAD)<br>▪ Production data or database plugin | ▪ Train AI model on a set of data to predict the FDM build time of a 3D model. | ▪ The build time |
| Unique Selling Proposition(s): | ▪ The current (before the project) accuracy of BTE for FDM had 65% predictions within tolerance. Early tests show that 88% is feasible with a trained AI model.<br>▪ Two variants can be provided: a pretrained model on a large database present at Materialise (the basic user model) and tools to train models on the customers database (the advanced user model)<br>▪ The system can improve over time as more data becomes available. | |
| Integration constraint(s): | ▪ Organized, quality AM production data: this is only limited available. Legacy data is not always useable.<br>▪ There is currently not a (commercial) system to use customer specific data.<br>▪ For the training of the AI-model at the user, training algorithms need to be provided. At this moment, free to use packages are used (Keras…) but this might change in the future. | |
| Intended user(s): | ▪ AM users and service bureaus<br>▪ Existing (software) customers | |
| Provider: | ▪ Materialise | |
| Contact point: | ▪ Michel Janssens – michel.janssens@materialise.be | |
| Condition(s) for reuse: | ▪ different business models can be applied: license, pay-per-use…<br>▪ OEM Contract | |
| | *Latest update: 2022-09-27* | |

Name: Build Quality Surveillance

| Input(s): | Main feature(s) | Output(s): |
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| ▪ Production **monitoring** data | ▪ Train AI model on a set of monitoring data | ▪ Detected anomalies<br>▪ Identified anomalies (diagnostic)<br>▪ Specific corrective actions. |

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| Unique Selling Proposition(s): | ▪ The tool provides new insights and a better understanding in the physics of the AM process under surveillance. |
| Integration constraint(s): | ▪ The method requires full access to monitoring data. Most of the legacy systems are “black box”. Materialise has an open controller (MCP) enabling this.<br>▪ The solution still requires insight and is intended as a tool for the AM expert rather than the user of AM machines.<br>▪ Integration with open AI environments is still complex (the interactive notebook of Sirris might help here) |
| Intended user(s): | ▪ AM OEMs<br>▪ AM experts |
| Provider: | ▪ Materialise |
| Contact point: | ▪ Michel Janssens – michel.janssens@materialise.be |
| Condition(s) for reuse: | ▪ OEM Contract, bilateral collaboration |
| | *Latest update: 2022-09-27* |

Name: Part recognition

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Models (STL, STEP, Native CAD)<br>▪ Cameras with edge computing capabilities | ▪ Train AI model on a limited set of virtual images of 3D model. | ▪ Part ID |

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| Unique Selling Proposition(s): | ▪ Reduces mix-ups of parts during manufacturing.<br>▪ Speeds up part identification |
| Integration constraint(s): | ▪ The functionality is still limited<br>▪ The system must still be “pressure tested” on robustness.<br>▪ The result is hardware specific |
| Intended user(s): | ▪ AM users and service bureaus |
| Provider: | ▪ Materialise |
| Contact point: | ▪ Michel Janssens – michel.janssens@materialise.be |
| Condition(s) for reuse: | ▪ different business models can be applied : license, pay-per-use…<br>▪ OEM Contract |
| | *Latest update: 2022-09-27* |

Name: A data-driven AI workflow for build-time estimation (BTE)

| Input(s): | Main feature(s) | Output(s): |
|---|---|---|
| ▪ 3D Objects (STL, Native CAD)<br>▪ Correct BTE | ▪ Extraction of features characterizing the 3D objects and automatic selection of the most important features for estimating the objects' build-time<br>▪ Use data-driven methods to divide the heterogenous set of 3D objects into homogeneous subsets<br>▪ Train independent AI models on the identified subsets for estimating build-times of the 3D objects<br>▪ Incremental learning and performance improvement as more data becomes available<br>▪ Capturing any validated BTE estimation into a reference repository | ▪ Reference repository composed of 3D objects – features - AI BTE models<br>▪ Estimation of the build-time of 3D objects<br>▪ Interactive notebook implementing the validated AI workflow to be used for research experimentation |

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| Unique Selling Proposition(s): | ▪ Build-times of 3D models are mainly predicted employing a global AI modeling approach using all parts in the heterogenous dataset<br>▪ As an alternative, the dataset can be divided into subsets of homogenous parts whose characteristics and building times are comparable<br>▪ This helps a data-driven algorithm to better learn the mapping between the 3D objects' characteristics and their printing time.<br>▪ Allows to gradually construct and maintain a reference repository composed of 3D objects, their characteristic features and the associated AI models for BTE estimation |
| Integration constraint(s): | ▪ Access to a large dataset of 3D objects to build independent AI models on the identified subsets of the data. This might not be readily available<br>▪ The AI workflow should be trained on a dataset in which the 3D objects were printed in the correct/optimal orientation and their build-times were computed accurately to make a reliable ground-truth |
| Intended user(s): | ▪ AM research labs<br>▪ AM users and service bureaus<br>▪ Existing (software) customers |
| Provider: | ▪ Sirris |
| Contact point: | ▪ Mahdi Tabassian – mahdi.tabassian@sirris.be |
| Condition(s) for reuse: | ▪ Different business models can be applied: license, pay-per-use…<br>▪ OEM contract |

*Latest update: 2022-09-27*