To Select the Best Tool for Generating 3D Maintenance Data and to Set the Detailed Process for Obtaining the 3D Maintenance Data

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Abstract. Three Dimensional (3D) maintenance data provides a link between design and technical documentation creating interactive 3D graphical training and maintenance material. It becomes difficult for an operator to always go through huge paper manuals or come running to the computer for doing maintenance of a machine which makes the maintenance work fatigue. Above being the case, a 3D animation makes maintenance work very simple since, there is no language barrier. The research deals with the generation of 3D maintenance data of any given machine. The best tool for obtaining the 3D maintenance is selected and the tool is analyzed. Using the same tool, a detailed process for extracting the 3D maintenance data for any machine is set. This project aims at selecting the best tool for obtaining 3D maintenance data and to select the detailed process for obtaining 3D maintenance data. 3D maintenance reduces use of big volumes of manuals which creates human errors and makes the work of an operator fatiguing. Hence 3-D maintenance would help in training and maintenance and would increase productivity. 3Dvia when compared with Cortona 3D and Deep Exploration proves to be better than them. 3Dvia is good in data translation and it has the best renderings compared to the other two 3D maintenance software. 3Dvia is very user friendly and it has various options for creating 3D animations. Its Interactive Electronic Technical Publication (IETP) integration is also better than the other two software. Hence 3Dvia proves to be the best software for obtaining 3D maintenance data of any machine.

Keywords: Data, Maintenance, Tool, Three Dimensional.

INTRODUCTION

The aim of this project is to find out which tool is most suitable for obtaining 3D maintenance data and set a detailed process for obtaining the 3D maintenance data. Maintenance or installation of any machine is usually done by going through huge paper manuals. This makes maintenance difficult and tiring and due to these, errors might happen. In order to avoid such errors, we use the technique of 3D maintenance.
3D maintenance data provides a link between your design and technical documentation creating interactive 3D graphical training and maintenance material.
3D maintenance data is needed for following reasons:

- Accurate installation documentation can be created.
- It would be easier to explain an operator and maintenance personnel about the product with the help of 3D maintenance data. A 3D data would also show an animated 3D illustration of the product.
- With the help of 3D data, the maintenance of the product can be done effectively and efficiently.
- This is used to communicate complex maintenance information or assembly information around the world in electronic form and hence there is a reduction in the amount of paper documentation.

- Since the maintenance of the given product is simplified with the help of 3D data hence the chance of failure reduces.
- Part catalogue of each part of the product can be obtained which would give the details of each part.
- As soon as the product is designed, the 3D maintenance data is obtained and hence the time to market is reduced.

All the industries are characterized by the longevity of products and large global capital projects making the maintenance of such products critical. Use of 3D maintenance leads to the following:

- Quickly and accurately create all necessary installation documentation
- Effectively train operators and maintenance personnel with an emphasis on safety
- Manage preventative and just-in-time maintenance
- Reduce downtime or failure – this is the single costliest through life cost
- Overcome language barriers with global customer base
- Deliver on-time and on-budget.

3D maintenance finds its application in aerospace industries, defense, building maintenance, automobile industry, railways industry, etc.

OVERVIEW OF THE WORK

- 3Dvia composer is 3D technical communication software that lets users explain products using existing 3D data.
- Users can create high resolution 2D illustrations and 3D animations to support a variety of product deliverables such as technical documentation, 3D work instructions, animated service applications, and sales and marketing collateral.
- 3DVIA Composer provides a comprehensive set of product documentation publishing or asset creation tools that are easy to use without compromising design control, flexibility or quality of output whether for electronic or print media.
- Product communication is all about clarity and there are few limitations on information presentation allowing users to get the often complex messages across effectively.
- Although priced comparably to a CAD seat, dedicated and optimized tools rarely turn out to be a wasted investment for professional, effective delivery so for workflows requiring high quality, up-to-date 3D product documentation; 3DVIA Composer could well be the tool of choice.

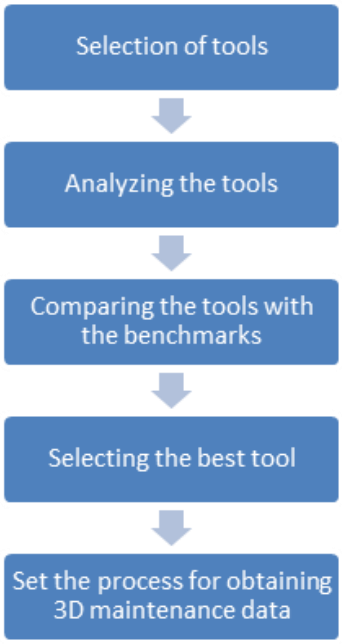


FIGURE 1. Process Workflow

The below section gives the description of steps that have been performed in this work.

Steps to Obtain the Best Tool

Step 1: Shortlist the tools used to obtain 3D maintenance data.
Step 2: Benchmarks are set that would help us to select the best tool from the shortlisted tools.
Step 3: All the tools are tested and analyzed and compared with the benchmarks set.
Step 4: The benchmarked features of all the tools are compared with each other and the best tool among all the tools is selected.

Steps to Obtain the 3D Maintenance Data of a Particular Machine

Step 1: A particular machine is selected and its CAD model is fed in the tool for generating 3D maintenance data.

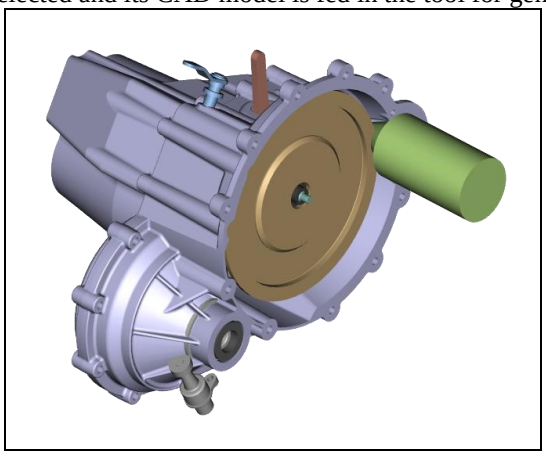


FIGURE 2. Gear Box

Step 2: The preferences are set.

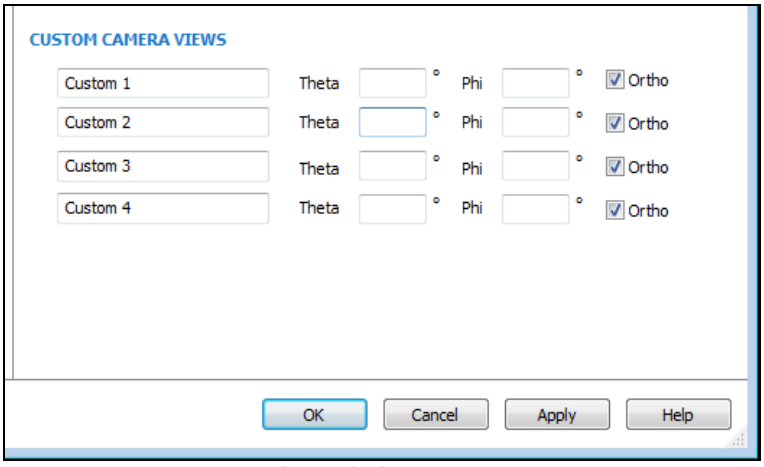


FIGURE 3. Camera Views

Step 3: The light preferences are set.

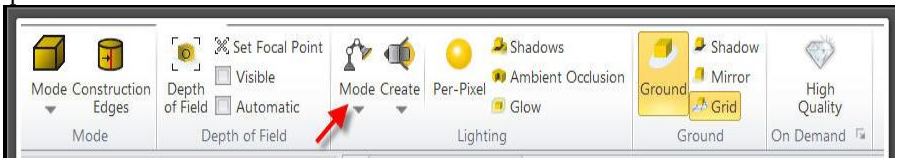
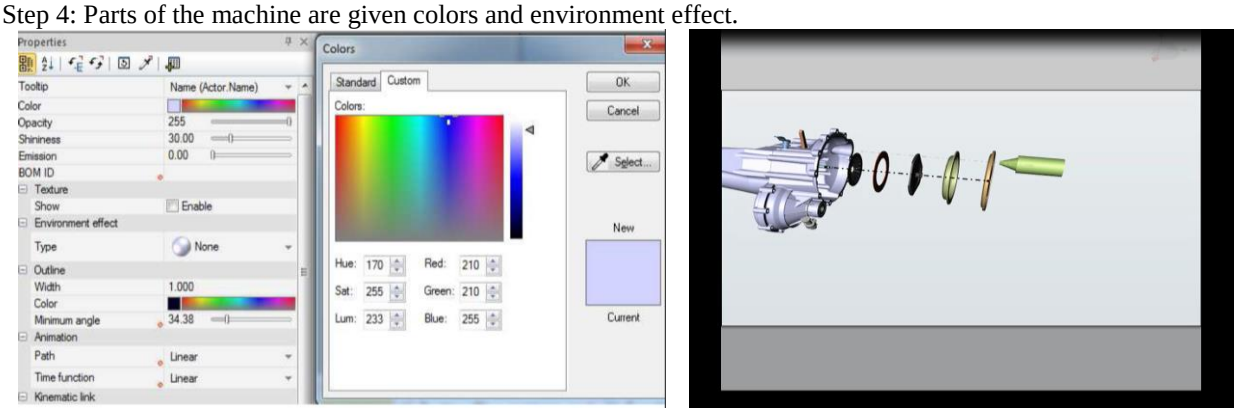


FIGURE 4. Light Settings

Step 4: Parts of the machine are given colors and environment effect.



(a) (b)

FIGURE 5. (a) Colors and Environment Effects (b) Exploded View

Step 5: Filtering operation is performed
Step 6: The machine parts are exploded in order to generate the IPC.
Step 7: Generate bill of materials

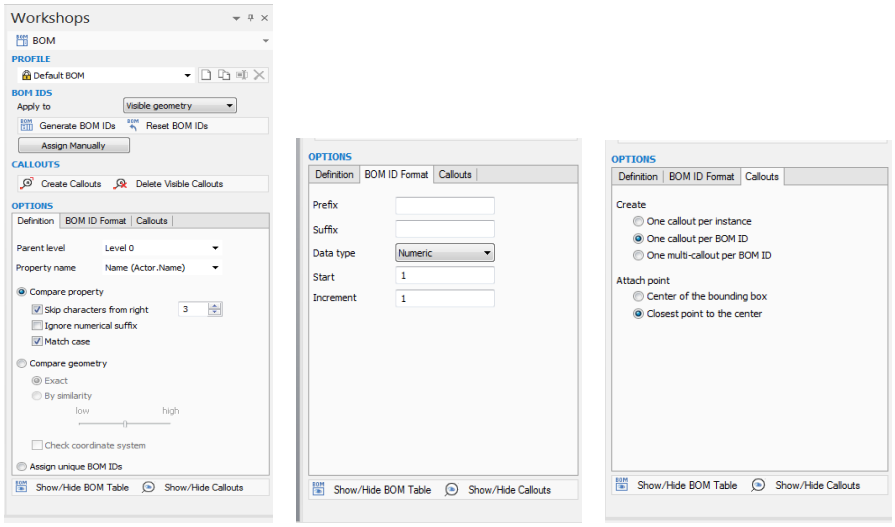


FIGURE 7. Bill of Materials (BOM) Workshop

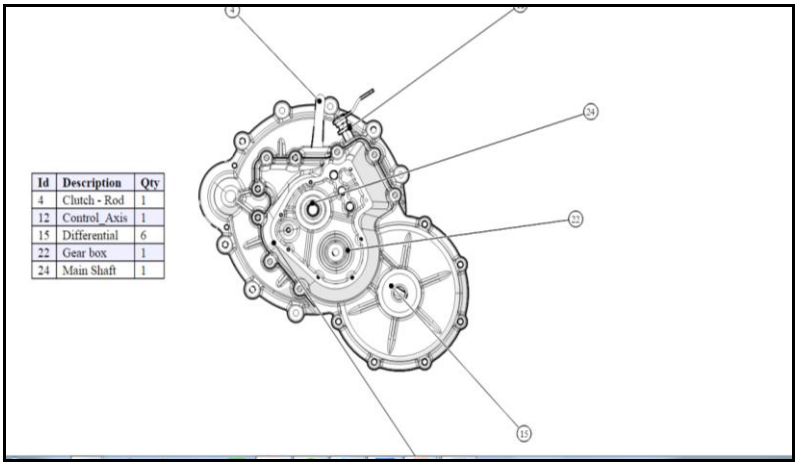
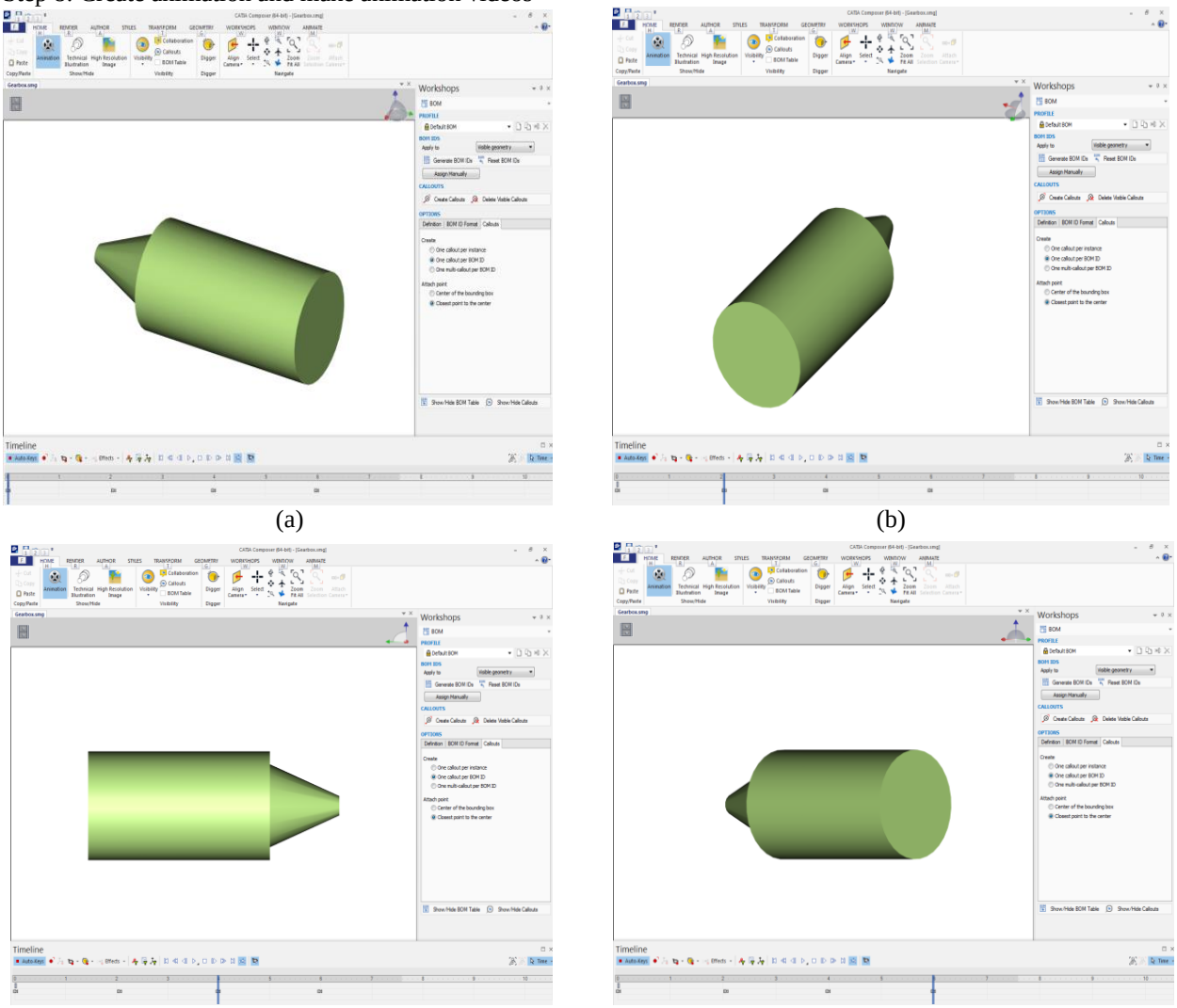


FIGURE 8. Bill of Materials (BOM)

Step 8: Create animation and make animation videos



(a) (b) (c) (d)

FIGURE 9. (a), (b), (c) and (d) One Axis Rotation

Step 9: Create views and use views

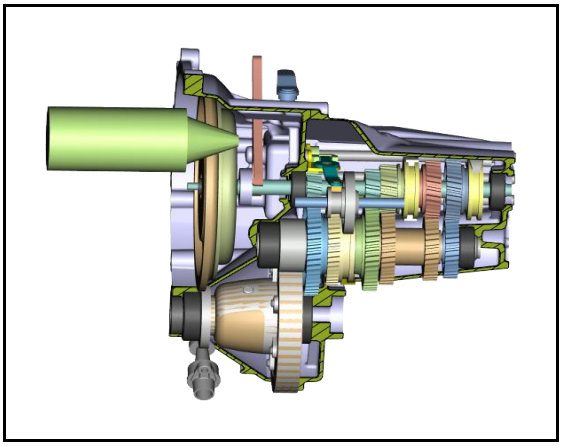
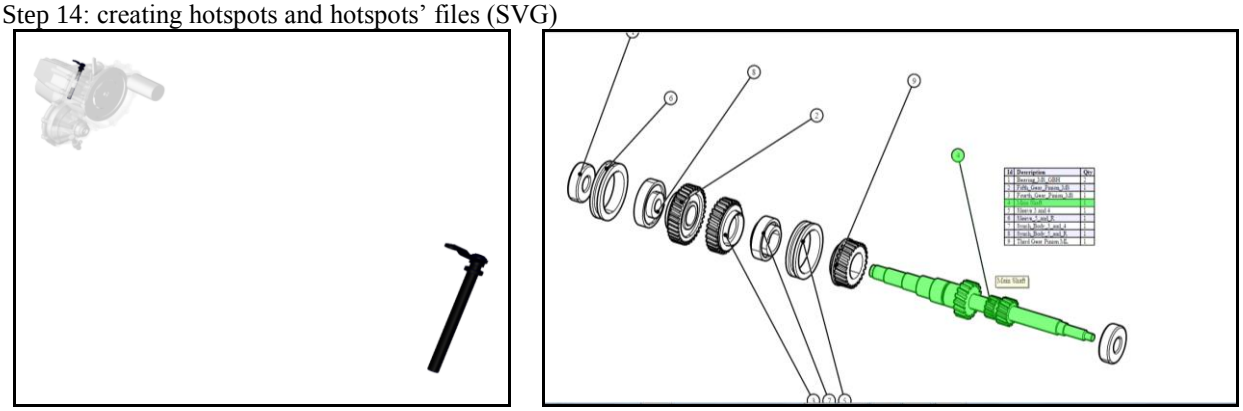


FIGURE 10. Assembly View

Step 10: Create views to lighten pictures
Step 11: Create views to generate hotspots' files
Step 12: Creation of ghost (locator)
Step 13: taking pictures from animation and views
Step 14: creating hotspots and hotspots' files (SVG)



(a) (b)

FIGURE 12. Hotspot File

EXPERIMENTATION AND RESULTS DISCUSSION

The best tools that provide the 3D maintenance data of a product are 3Dvia, Cortona 3D and Deep exploration
In order to select the best 3D maintenance data tool, a few criteria of bench marking are set. They are Compression, Rendering quality, User interface, Technical publications capability, Animations capability and Integration of files into interactive electronic publications.

TABLE 1. Comparison of the Tools

Criteria	3Dvia	Cortona 3D	Deep Exploration
Data translation	★	★	★
Compression		★	
Rendering	★		★
User interface	★		★
Technical publication			★
Animations	★	★	
IETP integration	★	★	

The features of 3Dvia are the data translation-focuses basically on SWX formats. Translators for CATIA, PROE and INVENTOR can be got. In 3Dvia the compression of data takes place as the maximum input data size is 505MB and maximum output data size is 100MB. Hence the compression ratio for 3D via is 1:7. It has a very good rendering quality and can assign materials but there is no HDR rendering. 3Dvia translates data to smg format and after that the data can be read in PDF and MS office. 3Dvia does not support any public format. It has a good centered around procedural animations and also 3Dvia has a very good user interface.
The features of Cortona 3D are the data translation uses older technology and largely interchange formats. In Cortona 3D the compression of data takes place as the maximum input data size is 505MB and maximum output data size is 4MB. Hence the compression ratio for 3D via is 1:150. It has an average quality of rendering. It has

lower end animations with rapid manual, rapid learning and rapid simulation. It has a good trajectory animation. It's not user friendly. It has no technical publications and the VRML file format is supported.
The features of Deep Exploration are data translation can import geo sets, parameters, large assemblies, instance names, captures/ model views, sheet metal, wire frame. In Deep Exploration, the compression of data takes place as the maximum input data size is 505MB and maximum output data size is 80MB. Hence the compression ratio for 3D via is 1:10. It has excellent rendering quality. It has multiple options on animations. It has a good user interface. With respect to technical publications, it has got a very good features to extract technical illustrations and the VRML file format is supported.
3Dvia is proven to be the best 3D maintenance software compared to Cortona 3D and Deep Exploration because of its efficiency in data translation. 3Dvia translates any SWX formats (CATIA, PROE, and INVENTOR). Cortona 3D has a better compression of 1:150. Whereas 3Dvia has a compression of only 1:7. 3Dvia has a very good rendering quality and can assign materials but there is no HDR rendering and Deep Exploration also has various option in rendering quality. 3Dvia and Deep Exploration is very user friendly as all the options needs to be used are available easily and too much of searching is not required. 3Dvia output can be converted to PDF and MS Word and has a Good cantered around procedural animations and has an excellent IETP (interactive electronic technical publication) integration. Hence 3Dvia meets maximum of the benchmarks and we select it as the best tool for obtaining 3D maintenance data.

CONCLUSION AND FUTURE SCOPE

The project aims at selecting the best tool for obtaining 3D maintenance data and to select the detailed process for obtaining 3D maintenance data. 3D maintenance reduces use of big volumes of manuals which creates human errors and makes the work of an operator fatiguing. Hence 3D maintenance would help in training and maintenance and would increase productivity. 3Dvia when compared with Cortona 3D and Deep Exploration proves to be better than them. 3Dvia is good in data translation and it has the best renderings compared to the other two 3D maintenance software. 3Dvia is very user friendly and it has various options for creating 3D animations. Its IETP integration is also better than the other two software. Hence 3Dvia proves to be the best software for obtaining 3D maintenance data of any machine.
3D maintenance finds a wide use in the maintenance division of all the industries. This method of maintenance will be in the market for another 20 years. In the future these maintenance data can be accessed in iPad and cell phones which will make the job of an operator easier. Customers and dealers could easily access these data and find out each and every detail about the particular machine. And this will reduce cost and increases productivity.

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