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TESTING FOR CAD-API

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ABSTRACT

- Automating the design process of a product or a system can provide engineers and designers with many benefits. With the use of the application Tech Note using the existing CAD system techniques we can help the engineering students to make the engineering drawing subject easily.
- The main advantage of Tech Note application is we can make all the drawings easily with low of cost, fast way process and students can understand the concepts easily. Instead of learning they can play with the concepts because it will be knowledge gain with boosting encouragement. The main thing is this software is user friendly so any user can enjoy using this application.
- The conversion from human to machine knowledge can also be achieved by using the application Tech Note and can increase the manufacturing of drawing structures in upcoming industries.
- Using the proposed methodic of 2D drawings conversion to the parametrical 3D objects it is possible to model the solid of any configuration. The detail drawing can be composed from complex sectional and auxiliary views.
- The developed mechanical desktop users menu from 2D to 3D and adequate tool bar facilities the 3D modeling works.
- After the automatization of 3D modeling process there was considerably reduced the time, which was required for the adjusting of created database to the CAM systems.
- The scope of our project is very simple, for drawing an structure in Engineering Drawing its takes more time we have to take chart, we have to measure all the lengths, angles it kills much time. When we come to 2D, when it is 3D it doesn't give the output that much easily.

INTRODUCTION

Almost every feature that is available in a CAD system can be automated. Thus, the use of the API is required when developing engineering applications.

- With the use of the application Tech Note using the existing CAD system techniques we can help the engineering students to make the engineering drawing subject easily.
- The main advantage of Tech Note application is we can make all the drawings easily with low of cost, fast way process and students can understand the concepts easily. Instead of learning they can play with the concepts because it will be knowledge gain with boosting encouragement. The main thing is this software is user friendly so any user can enjoy using this application.
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Objective:

The main moto of this project is to develop software that works on the engineering drawing and to design the E.D concepts.

Scope:

- Using knowledge Base Engineering (KBE) system getting better quality design at lower cost and reduce the efforts.
- The main advantage of Tech Note application is we can make all the drawings easily with low of cost, fast way process and students can understand the concepts easily. Instead of learning they can play with the concepts because it will be knowledge gain with boosting encouragement. The main thing is this software is user friendly so any user can enjoy using this application
- The scope of our project is very simple, for drawing an structure in Engineering Drawing its takes more time we have to take chart, we have to measure all the lengths, angles it kills much time. When we come to 2D, when it is 3D it doesn't give the output that much easily.
- So for making the cost reduction and for the fast production of output, and for Drawing a simple and fast 3D structures within seconds.

LITERATURE SURVEY

Many researchers have used the API of various CAD systems in order to develop applications and tools, and always the conclusions dictate that the benefits and the advantages of the API are vast. According to Kyratsis et al., up to date CAD software environments are filled with powerful modelling capabilities and by using the API of a modern CAD system, the DRILL3D software

routine was developed.

The application creates parametrically controlled tool geometries and by using different cutting conditions, achieves the generation of solid models for all the relevant data involved during the drilling manufacturing process (drilling tool, cut workpiece, undeformed chip etc.

Neto et al developed a CAD based system in order to program a robot from a 3D CAD model, allowing users with basic CAD skills to generate robot programs off-line. Another in 2019 use of the API can be found in the study of Haba and Oancea on the manufacturing technologies that are designed for the assembly of a single cylinder, four strokes, air cooled engine block.

Badan et al and **Oancea et al** developed a software tool in 2017 that allows user to generate different types of holes, on parallelepipedic solids, starting from different references as edges, vertexes, known points on the solids, or different types of entities which are placed on the solids.

Abdullah Z et al (2015). Improving Malaysian engineering graduate ability to read and interpret engineering drawings. UTEM. The present paper acknowledges that with the use of the automatic programming interface of a general purposes CAD system, it is possible to develop a collection of CAD based applications that can be easily accessed with the help of a simple user interface.

Arkkelin D et al using SPSS to Understand Research and Data Analysis. Psychology Curricular Materialssychology Curricular Materials at 2015, 194. The presented applications were developed with the VBA (Visual Basic for Applications) programming language that is embedded in the selected CAD system. One such application can be used to build the solid models of the pneumatic cylinder's components complying with the ISO 15552:2004. Then, the built models are combined to form the assembly of the pneumatic cylinder.

Serdar T et al Enhancing Spatial Visualization Skills in Engineering Drawing Course. In 122nd ASEE Annual Conference & Exposition at 2018. Subsequently, with the complete assembly model, more functions become available. Such as the automatic mechanical drawings creation for each component and the extraction of the assembly's properties that can be stored to a Microsoft Excel™ file for further study. With this collection of applications, the pneumatic cylinder application can become a workstation for routine CAD based processes.

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TECH NOTE APPLICATION ARCHITECTURE

Tech Note application mainly based on 3 steps

1. TN Geometry
2. TN Database
3. TN Application

- This TnApplication is built with java Fx. This is a architecture friendly as built with Java .In Tn geometry we have all methods responsible for mathematical calculations.
- TNDatabase is responsible for all save and retrivement of data. Then comes the TnApplication where every entity has corresponding class like circle entity has circle class, line entity has line class. The TN application lies below the Tncommands. The Tngeometry and TnDtabase lies beside

TN Geometry:

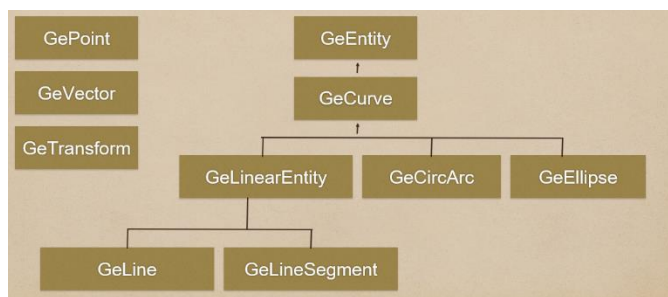


fig 3.2 TN Geometry step process

- Tn Geometry all the codes will be present in this below the packages as shown above like GeEntity, GeCurve, GeEllipse so on etc.
- Codes present in this are to draw a point or line or for all the mathematical operation where ever it is required to do so this geometry will take place and go ahead with the work.
- This Geometry is only for passing the values the overall database will be working in the database environment which is the second data model in this Tech Note applocation



fig 3.1 TN Architecture

- The above specifies how the application, commands , geometrical points and database are placed. In commands we have specifications of the entities like line, circle, ellipse, fillet, arc and polygon. With these commands we select according to our requirement.
- Then comes the TnApplication where every entity has corresponding class like circle entity has circle class, line entity has line class. The TN application lies below the Tncommands. The Tngeometry and TnDtabase lies beside each other and lies below the TnApplication.

TN Data base:

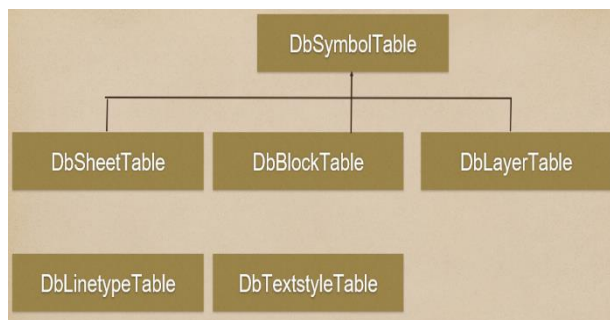


fig 3.3 TN database

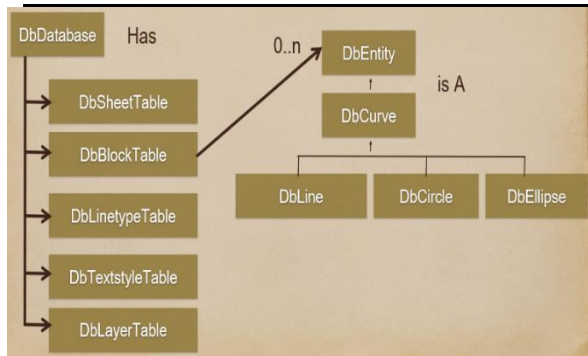


fig 3.4 TN Geometry step process

- TN Database will be working in background for storing the data base or for knowing what to measure and what type commands should be used at what time. Everything will be stored in the data base
- If any person want to know about the values stored and commands want to be used everything will be stored which can be visible for all the people who are using the application.
- We have seen the Geline, GeCircle, GeEllipse and so on.. here we are able to see all the things like Dbline, DbCircle, DbEllipse. That mean everything is interlinked here what ever the command we are using the same database class will be called so that the commands will be called and executed simultaneously.
- Every Dbentity further has a DbCurve which is classified into further corresponding shapes
- While coming to DbSymbolTable,it has
 - DbSheetTable-The data regarding the sheets are stored to SheetTable
 - DbBlockTable-Whatever we entity we draw are stored to he BlockTable
 - DbLineTypeTable-The data regarding the Lines and it's types are stored to LineTypeTable
 - DbLayerTable-The data regarding the Lines and it's types are stored to LayerTable
- DbLineTypeTable-The data regarding the Lines and it's types are stored to TextstyleTable
- The every time you select a operation it is executed as separate thread and continues the operation until the work dones.
- Java multithreading is implemented in this Tn software to achieve multitasking

TN Application and commands:

- Application is the main moto of the project “Tech Note”.
- This application will be running under the two basis of geometry and database.

- Commands will be used to help to work done faster. Mean without picking the shortcuts all the time we can use the commands in the command box and we can draw the structures.

Architecture Diagram:

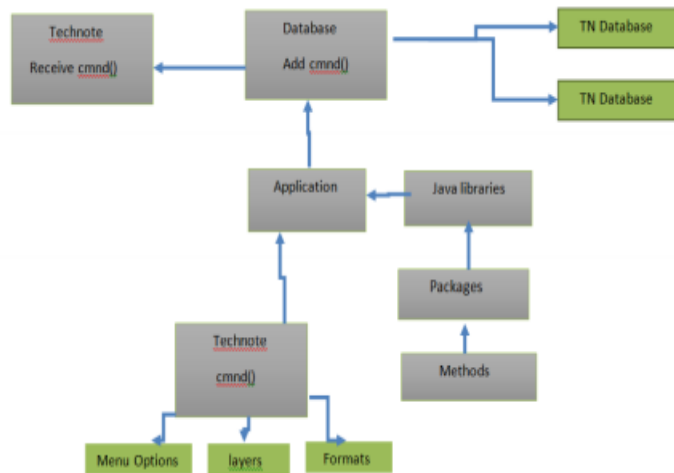


fig 3.5 Architecture diagram

- In technote editor we have menu options, layer options, formats where we can specify the dimensions such as line ,arcs, circles and projections etc...
- With refer to given command it goes into methods in java application when method is called it stores in database according to given command the data got stored either in TN database or in GN database..And thus in the technote the command output got executed.

UNIT TESTING

Checking the functionality of the program :

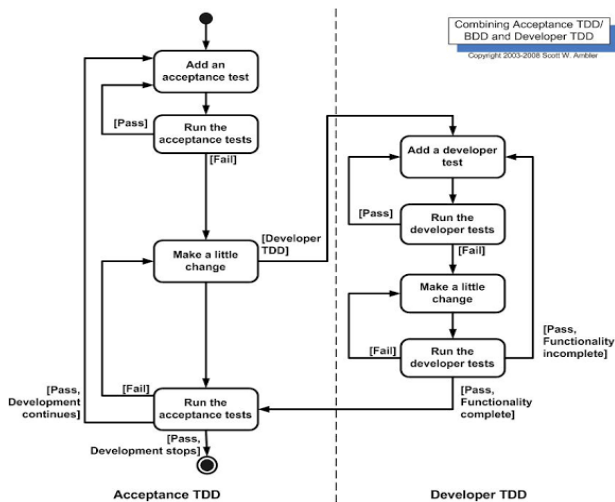


fig5.1 Step Process for error correction

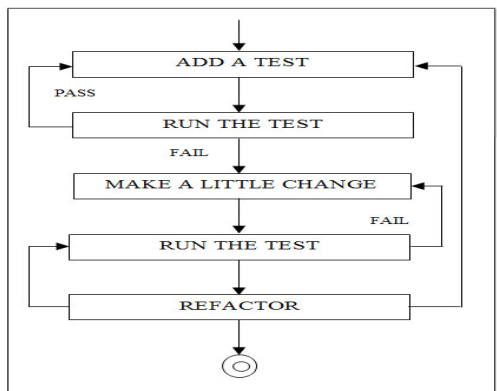


fig5.2 Main methodology for Errors detection

- when we write a code we need some of the requirements to get output as success.
- The above mentioned figures 5.1 and 5.2 are the process involved to execute the program successfully.
- Firstly write the code with the requirement needed as per the logics needed by given questions.
- Run the test and if the code got successful then we can directly implement the code and can get output but if the code get fails then makes little changes and again run the code and follow the same process.
- Fig 5.1 shows in detail process of user and developer stage. And fig 5.2 shows the reversible process of getting output as success.

we can know that the codes written correct or not.

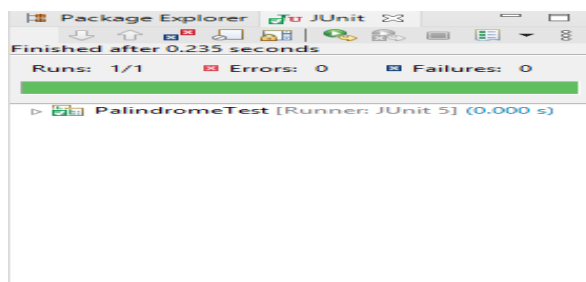


fig 5.3 JUnit Success Report

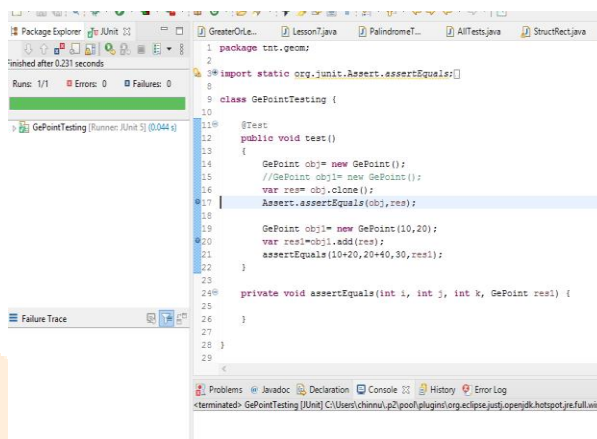


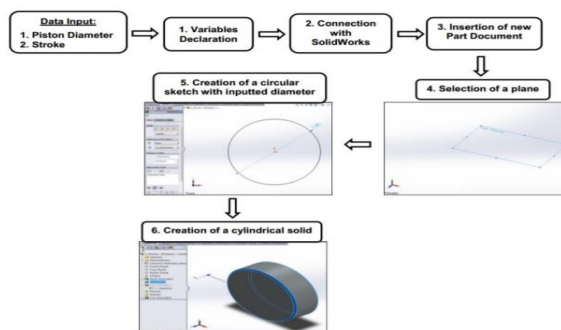
fig 5.4 Sample program with success

JUNIT Testing:

- Unit testing is used for knowing where our program is getting failed
- And how the program is running with the multiple test cases. Picking many samples outputs and testing the values with the written code. As shown in below fig 5.3 it shows the testing is failed or passed.
- If the testing is passed then the resultant output will be shown in green color or else the output will be shown in red color.
- If the color at the output is red then it shows that, the written test code was some where wrong we can make changes in the logic and we can get the code tested successful.

ASSEMBLY PROCESS

- When it is the turn of assembly process the designing process is divided into some steps.
- The all the steps are helped to execute the built in parts of 3D models to each and every component.
- Figure depicts the steps used in the cylinder piston.
- Inserted data is used to initialize the required variables and the values when the primary come dimensions are given by the person who is using the design methodologies. And the secondary dimensions are came from the mathematical equations of primary content data.
- For example the width of the piston -> called specific percentage of its diameter.



- Below we had attached GePoint Testing which is the starting stage of geometry point representation and the following output also got successful at last.
- We can make testing for all the geometry codes and

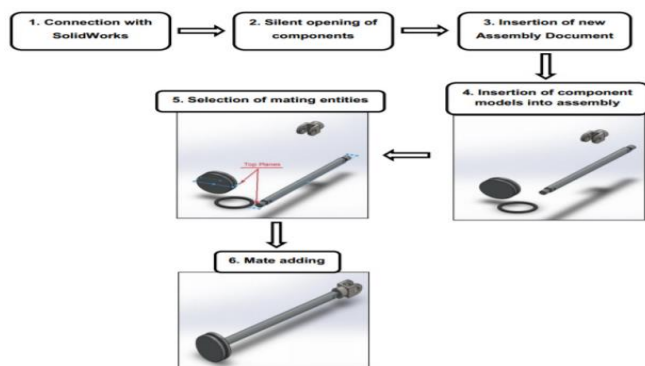


fig 6.1 & 6.2 Assembly Process

Last stage of designing is the making of cylindrical assembling in the above example. And the required essential parts for comprising the assembly loaded from saved folders so this is important for the assembling in the setting stage of component model.

- Using special properties of mechanical each part is assigned in the order everything is presented by using ISO 15552 methodology. All the values used in this cad application is taken from the library where that contains all the collection information about all the materials by making the techniques of the CAD software. The property and the essential parts will be changing according to the use of requirement while the methodology is processing. This methodology meant that the air pressure is depending by the material section.
- This meant that material selection is depending upon the air pressure.
- Used methodology for the assembling process is bottom up methodology. When we go into the assembling process them we look into modeling first and then they will be inserting into the assembling process for the positioning. When the assembling process is going on the structure of the assembling process are almost identical for this pneumatic cylinder model. We can make use of different design approaches when we know the process hoe to make any 3d assembling by visualization at least then we can convert that into the assembling process using this cad application easily.
- By using the following techniques the same procedure can be followed for any transformation of assembling process and make them into it. The same process can be used every time but with the different perception and use.

CONVERSION FROM 2D TO 3D DIAGRAMS

Conversion of 2D detail drawings to parametrical objects in Mechanical desktop system:

- In this interactive modeling method allows to create 3D parametrical objects in MD systems, using 2D parts detail drawing files with extension are presented.
- An appropriate methodic algorithm for realization of this task, special users fragment menu ant toolbar from 2D to 3D were created.
- Those items contain macros and special commands created by employing AutoLISP programming language.

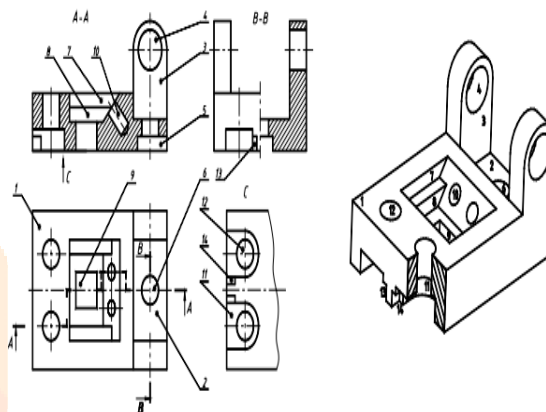


fig 9.1 Detail 2D to 3D conversion

- Design process for all object oriented systems is similar: closed profile must be created parametrical dimensions are indicated.(this can be corrected at any stage of design process if needed).
- 3D objects can be created from the drawn profile using extrusion, rotating, lofting and other operations.
- The final object is the complex of all 3D objects combined with operations attached of it.
- The main labour expenditures of 3D parametrical modeling depend on profiles creation and its orientation in the space. Many additional operations must be executed for realization of these steps.
- Information concerning 2D profile extraction from within detail drawing.
- Profiles orientation in the space with respect of elements of new formed model.
- Automated creation of sketch and profiles inside of it.
- Creation of 3D parts using interactive way.

Algorithm of subsystem for conversion 2D drawing to 3D objects:

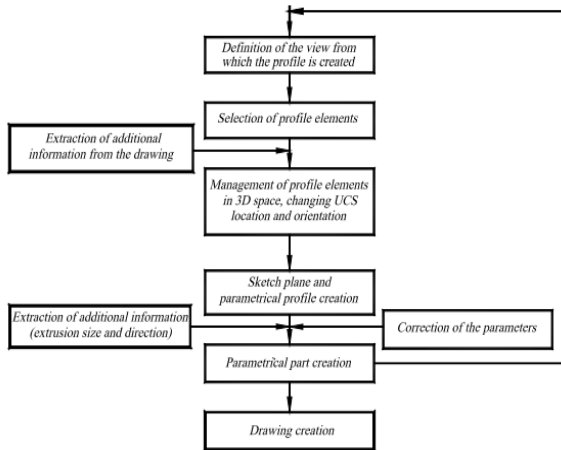


fig 9.2 Algorithm of sub system

- Algorithm of 2D drawings transformation to the 3D parametrical objects is presented in the fig 9.2.
- The format of additional information depends on the stage of algorithm execution and is related with sectional view estimation, definition of extrusion distances.
- It should be mentioned that the presented methodic also has the limitations: the 3D parametrical model is built in the same file as the part drawing, the qualified engineering skills are required for the parametrical 3D model creation.
- The user will premeditate the operations sequence, there are a lot of information which must be executed interactively.
- These problems are important and will be studied in the future.

DESIGN OUTCOMES:

As the main concept of this is to create the a software that digitalizes the engineering drawing concepts. We have created some of the examples on this TN software

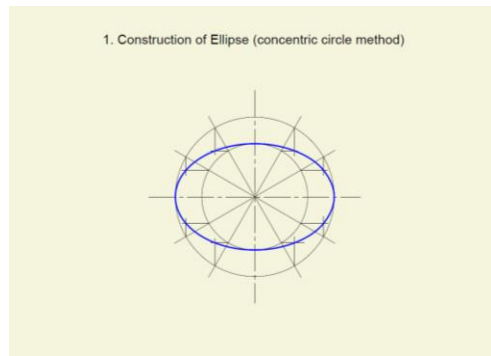


Fig.8.1

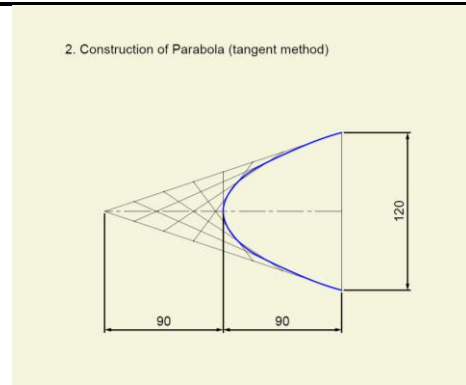


Fig.8.2

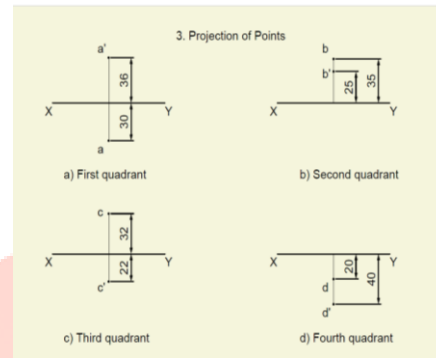


Fig.8.3

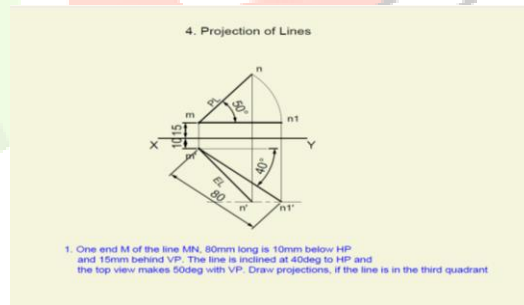


Fig.8.4

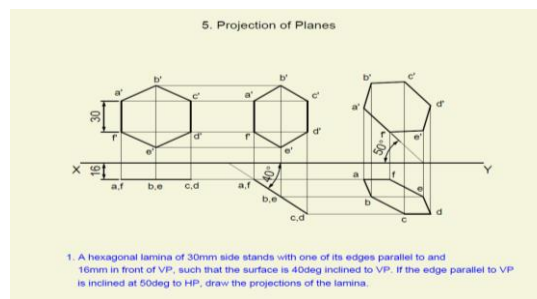


Fig.8.5

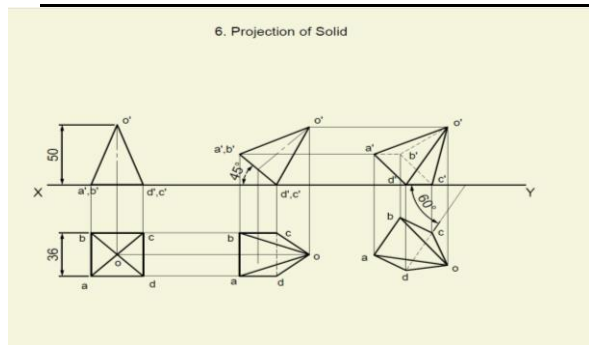


Fig.8.6

In this application, there is also a special feature called Isomorphic view where the whole plane is tilted for 30 degrees of angles. This view helps the clients to create or 3D figures in 2D planes with ease. With the click operation the user can also shift between Top view, side view, and front view.

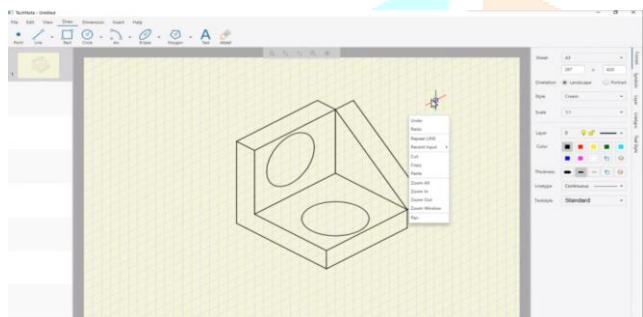


Fig.8.7

Conclusion:

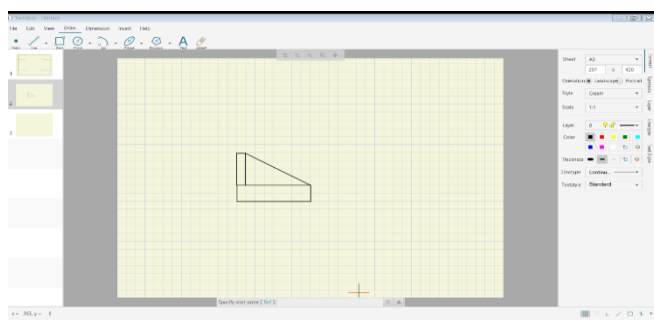
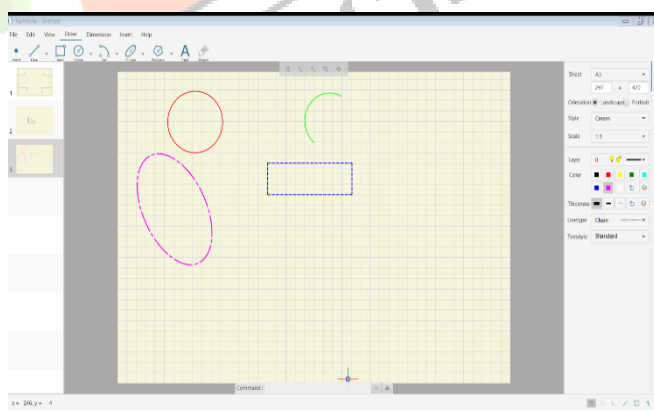
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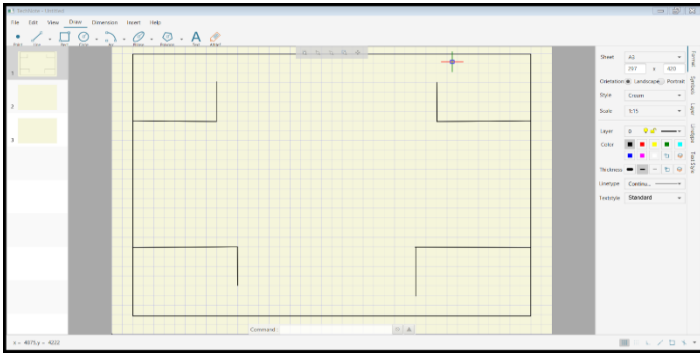
References:

- Implementation of E.D concepts we are referring to the books of Mr.Jeypoovan.
- P. Kyratsis, N. Bilalis, A. Antoniadis, Int. J. Mech. Syst. Sci. &Eng. 1,129 (2009).
- P. Neto, J. N. Pires, A. P. Moreira, IEEE International Conference, 1, (2010).
- S. A. Haba, G. Oancea, Int. J. Adv. Manuf. Technol. 80,747 (2015).
- I. Badan, G. Oancea, EMESSEG International Conference, 1, (2010).
- ISO 15552 Pneumatic fluid power - Cylinders with detachable mountings, 1000 kPa (10 bar) series, bores from 32 mm to 320 mm - Basic, mounting and accessories dimensions (2004)
- Kersys R, Nenorta V, Pilkaite T, survey of automated design systems development. Mechanical technologies, scientific works, kaunas university of Technology, Kaunas:Technology.
- AutoCAD release 2002 Customization manual, Autodesk Inc 2002.
- Ciuprins V, Nenorta V, Graphical objects creation with AutoLISP programming language. Kaunas University of Technology, technology ISBN.

Outputs:



Converting 2D to 3D:



Output:- (2d to 3d):

