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HOME PLAN AUTOMATION

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Abstract: When people want to buy a flat, the flat may not be always available for the buyers to visit the flat in person. So, it is necessary for them to see the floor plan of the desired flat. However it is not realistic by just seeing the 2D floor plan; and it is difficult for people to imagine the actual environment. Therefore 3D model of the flat can be used. It is found that 3D modeling of a flat is not commonly used by normal users nowadays. The main reason is the common existing 3D visualization tools are difficult for non technical users to create a 3D model of a flat with interior design. Most of the tools do not have a graphics recognition feature to automate the 3D model generation. The aim of this project is to implement a system that can create a 2D floor plan and automatically generate a 3D model according to the 2D floor plan created. This software mainly targets on the users who do not have technical knowledge of making 3D computer graphics. So a user-friendly interface is designed for them to create a 3D model easily. In order to automate the generation of 3D model, the Java 3D libraries are used. The objects in the 2D floor plan, including walls, doors, sofa and tables can be created the system. The software interface is created using the JavaFx libraries. This software has separate TNDatabase where the details of every entity are stored.

INTRODUCTION

Nowadays, when people want to buy a flat, it is not a must for the buyers to visit the flat personally. Sometimes, the flat may be not available for visitors, or the buyers may not be free to visit so many desired flats. So, they can only seeing the floor plan of the desired flat. However it is difficult for people to imagine the actual environment by just seeing the 2D floor plan. Buyers would also like to see what will the flat look like if some furniture are put inside the flat. Therefore 3D model of the flat can be used. It is found that 3D modeling of a flat is not commonly used by normal users nowadays. Therefore the aim of this project is to develop a

user-friendly software, to let normal users to create a 3D model by simply creating a 2D floor plan in this TechNote software.

Objective

The aims of this project are to,

1. Implement software that can create a 2D floor plan and automatically generate a 3D model according to the 2D floor plan created.
2. Design a user-friendly interface which allows non-technical users to create and modify 3D computer graphics model.

Target Users

This software mainly targets on the users who do not have technical knowledge of making 3D computer graphics. The generation of 3D mode form 2D floor plan is the main easy-to-use feature to attract normal users. Users may use the rendered 3D model to get the idea of how the environment of a flat looks like. Also, they may use it to design their home decoration by themselves. This project also targets on students where then can implement their engineering drawing concepts.

2. According to the 2D floor plan created, a 3D computer graphics model can be generated by a simple command

3. This software not only creates 3D visuals Of the 2D floor plans it can also act as a base for the implementation of the engineering drawing concepts. The GUI of this software created can serve both activities

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 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.

Similarly, Badan and Oancea developed a software tool 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.

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.

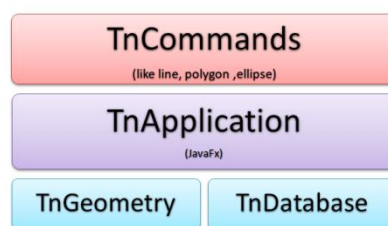
The presented applications were developed with the VBA (Visual Basic for Applications) programming language that is embedded in the selected CAD system. One such application can be used to build the solid models of the pneumatic cylinder's components complying with the ISO 15552:2004. Then, the built models are combined to form the assembly of the pneumatic cylinder.

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 TM file for further study.

With this collection of applications, the pneumatic cylinder application can become a workstation for routine CAD based processes.

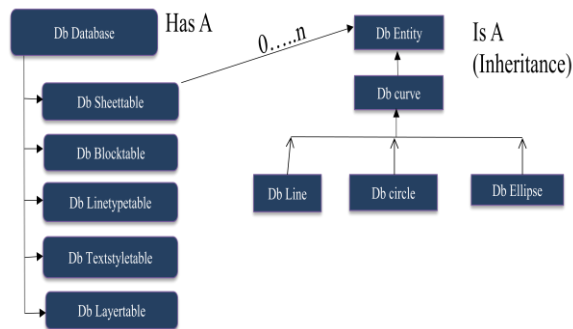
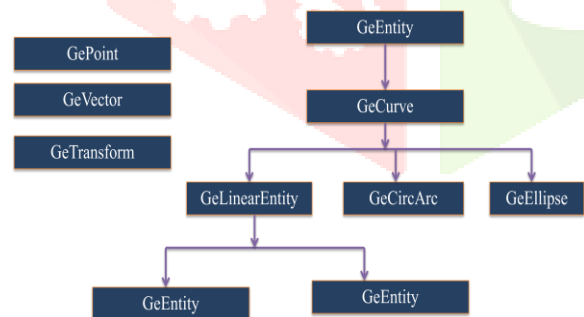
SYSTEM ANALYSIS:

System analysis is a method of figuring out the basic elements of a **project** and deciding how to combine them in the best way to solve a problem. The designing of an efficient computer **software** for a construction field where we can apply all our civil methodologies .Let us see what are the basic elements or how the the TN software is used

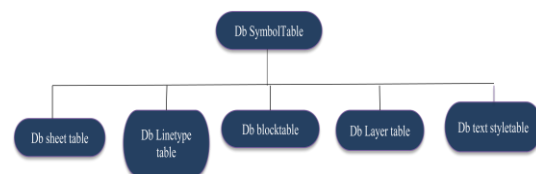


The above specifies how the application, commands, geometrical points and database are placed. In commands we have specifications of the entities like line, circle, ellipse, fillet, arc and polygon. With these commands we select according to our requirement. Then comes the TnApplication where every entity has corresponding class like circle entity has circle class, line entity has line class. The TN application lies below the Tncommands. The Tngeometry and Tndatabase lies beside each other and lies below the TnApplication. This TnApplication is built with java Fx. This is an architecture friendly as built with Java. In Tn geometry we have all methods responsible for mathematical calculations. TNDatabase is responsible for all save and retrieval of data. The key problem of engineering drawings understanding is how to recover the losing information of geometry and topology at the projective depth direction. Experienced engineers often understand projections by the method of body analysis. Main steps of the method are as follows:

- 1) A complex body is divided into parts by decomposing view-loops.
- 2) Corresponding loops selected from three views are validated their coherence according to rules of orthographic projection;
- 3) Corresponding 3D model are generated from typical patterns according to view loops and multiple interpretations are eliminated by views testing.



- ◆ TnGeometry is responsible for all the mathematical calculations taking place in the Technote
- ◆ This TnGeometry Has all the corresponding 2Dfigures e.g. Point, Line, Circle, Ellipse, polygon of different sides.

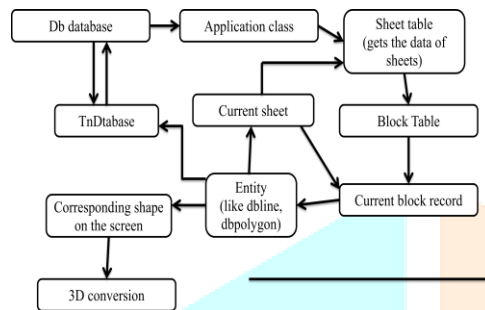
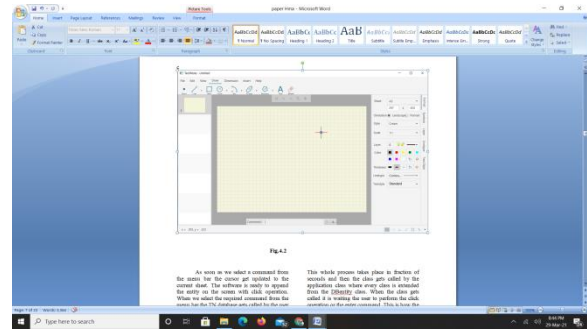


- ◆ TnDatabase is the place where whole action performs. It contains DbDatabase which further has DbSheettable, DbBlocktable, DbLinetypeable, DbTextstyletable, Db Layertable
- ◆ Every DbSheettable has N number of DbEntities
- ◆ Every Dbentity further has a DbCurve which is classified into further corresponding 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

SYSTEM DESIGN

In general, this system let users create a 2D floor plan file and the system will provides .functions for automating 3D models generation. All the 2D configurations and shapes models are provided for users to add and modify in the system. The main thing is the user does have an idea of how his dream house to be constructed.



- ◆ This TechNote software is user friendly software which is building stage. The language used is JavaFx.
- ◆ What ever you see like line, polygon and any curved shape etc., for each entity their will be a corresponding database and a class
- ◆ Everything is derived from the Dbentity
- ◆ Entities like Dblink will in turn holds a reference to Geline
- ◆ Dbcircle will in turn holds the reference to Dbcircle
- ◆ We convert whatever the shape on the current sheet to 3D visual with the help of 3D command
- ◆ DbDatabase has the functions to read ,write and save to the files
- ◆ DbDatabase also has the functions to draw on the screen
- ◆ These 3D shapes are built with the help of Java3D libraries

Technote Application

The process starts like this when we open the TN software we can see its appearance like as below

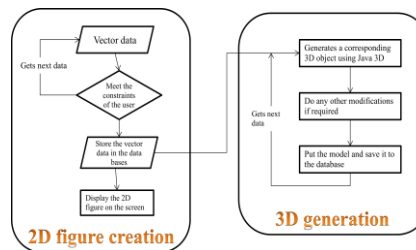
As soon as we select a command from the menu bar the cursor get updated to the current sheet. The software is ready to append the entity on the screen with click operation. When we select the required command from the menu bar the TN database gets called by the user it calls the application class .In this application class we can see corresponding class to corresponding command or corresponding entity.

This application class gets the data of the sheet table to locate where the client is working. The value of the current sheet is updated in the database. This current sheet in turn has the records of the blocks. The data of the current block is updated to the current sheet as well as the sheet table. Now the main function performs the TN database is updated with all the current values.

This whole process takes place in fraction of seconds and then the class gets called by the application class where every class is extended from the DBentity class. When the class gets called it is waiting the user to perform the click operation or the enter command. This is how the system is designed. After this the TNdatabe will be waiting for the command so as to operate.

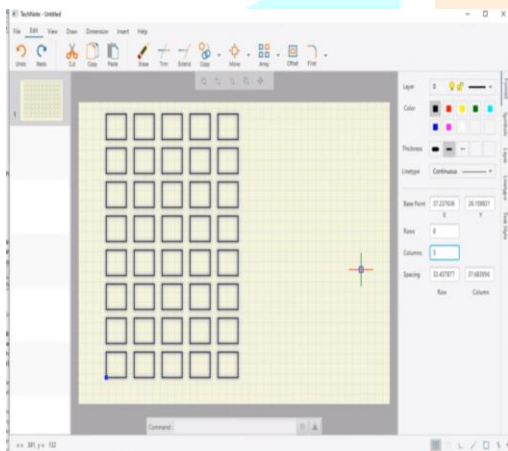
- This is how the application looks like. The above mentioned in the figure are the shortcuts to insert any of the things.
- If we want to access the commands we can we can write the command name in the below command box.
- There are many shortcuts right side of the screen which are used to make the thickness of the line and color of the line and what type of paper should be used with what type of ratios and so on.
- Right last below there is a box which represents the lines in the page like the isometric planes we can draw (iso right, iso left, iso top) which changes the default line in the pages to the angle positions and we can draw the cross lines easily as fast as we can.

- There is slide at the left side we can use N number of slides at same the time as use in Microsoft power point.
- This application is user friendly any person can play with the application. Any person can insert any number of new commands and implement there own java code in the applications.
- Like drawing circles, lines, planes etc.
- There is an option for copy paste also we can copy the structure from one slide and paste the structure in another slide.
- In this we can prepare N number of slides and we can make slideshow like we can explain each slides clearly using slide show option like same as power point.
- This application consist of combination of many things like CAD(for ED subject, power point).
- As this is a user friendly we can draw any number of boxes within the less time as mentioned in the figure



By using JavaFx we develop 2D figures and with the help of Java3d libraries we can create 3D visuals. The above explains activity flow where the activity performs as first it collects the vector data then this vector data is used to meet the constraints the user .Then the vector data is set in the databases. Then the image is appended on the sheet. This is how the 2D figure is created on the Technote editor.

After the creation of the 2d figure on the sheet when we use the 3D command to convert it to 3D visual. Then happens the generation of corresponding 3D object using Java3D.Then we can do any modifications if needed according to the requirement of the client. Then the model is shown on the screen. Again the process repeats the editor waits for the client to provide the vector data.



Activity Diagram:

CLASS DIAGRAM

When the user open technote editor, the user should give command regarding to their requirements ...according to the command it goes to java packages, methods and libraries in java application then it goes to the database and store or retrieve the sheets, which then gives output in technote editor.

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Sequence of command execution:

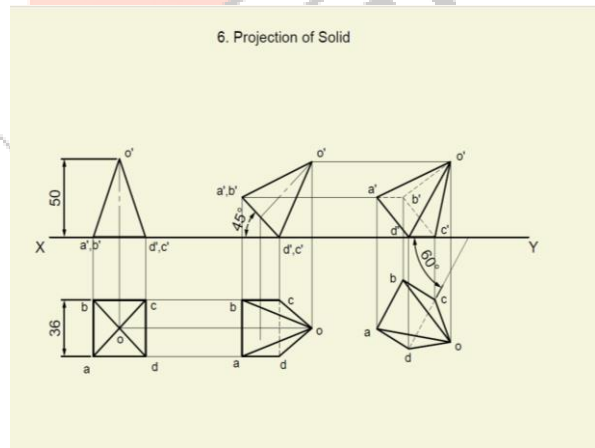
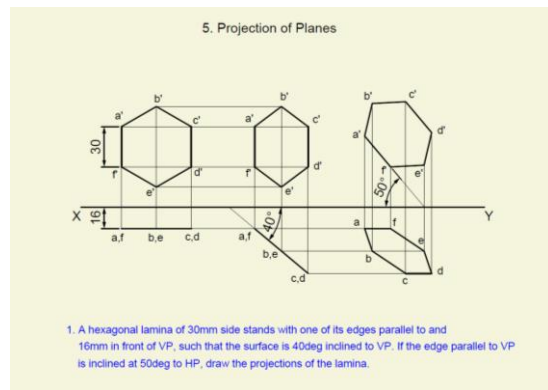
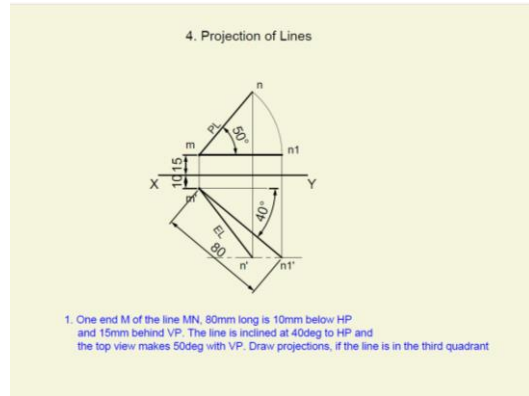
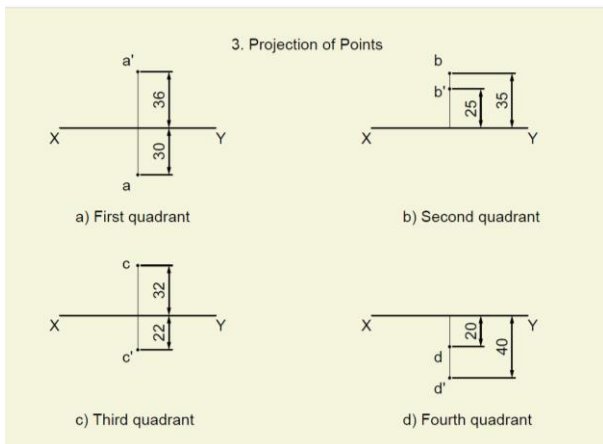
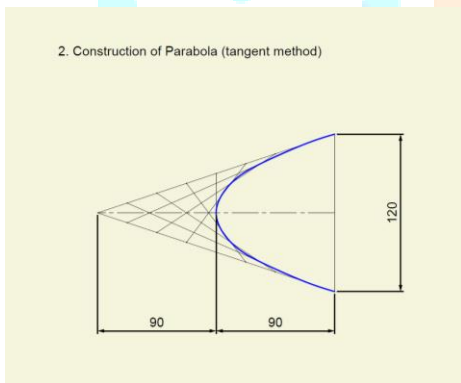
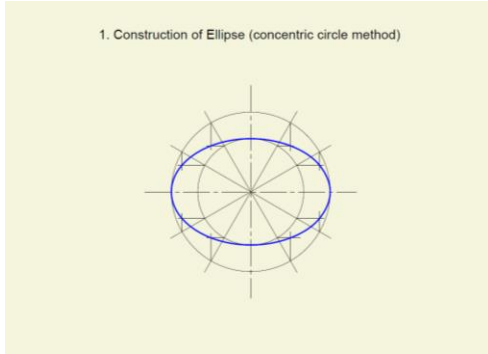
The user give command in technote so it goes into line command and in editor it goes as point where in database according to given point the

Component diagram:

The component diagram for the Technote software i.e. for Home plan automation. In unified modeling language component diagram depicts how components are wired together to form larger components or software systems. They are used to illustrate the structure of arbitrarily complex systems.

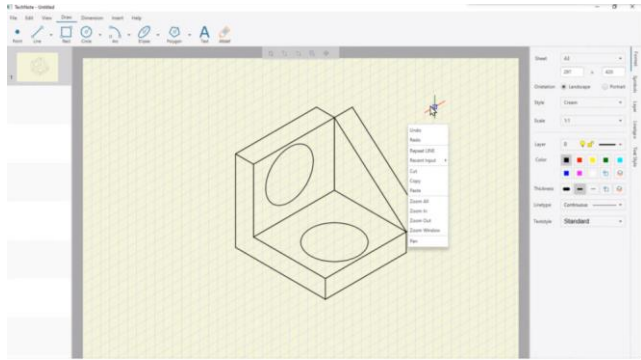
DESIGN OUTCOMES:

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



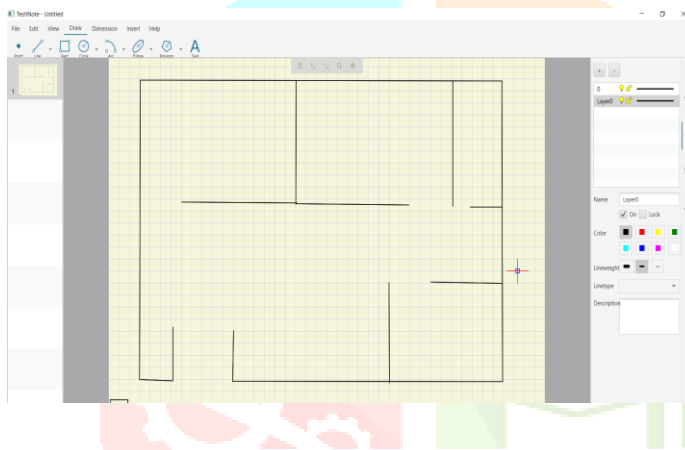
In this Tnapplication, there is also a special feature called Isoorphic view where the whole plane is tilted for 30 degree of angles. This view helps the clients to create or 3D figures in 2D planes with ease. With the

click operation the user can also shift between Top view, side view, and front view.

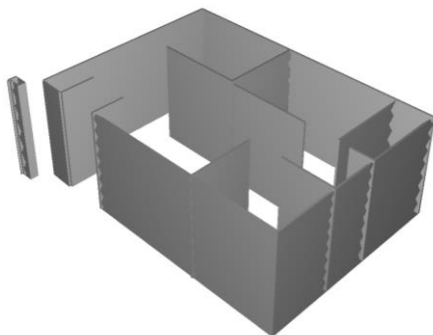


9.SIMULATION OUTCOMES

Let me show you the example how the 2D floor plan is converted into 3D.



OUTPUT



CONCLUSION

- With the use of the API of a general purposes CAD system it is possible to develop applications in short time that can be used to analyze various engineering situations.

- The main advantage of such applications is that there is no need of any physical model in order to simulate and analyze any engineering processes, or even to extract data. It is also clear that the programming of the API can speed up many standard CAD processes and save time that can be better allocated.
- The development of human to machine interfaces can also be achieved with the use of the API and can drastically increase the manufacturing productivity in today's modern 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.

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