1 Introduction

1.1 What is eCAD?

Figure 1: eCAD logo

eCAD is a fully comprehensive 2D CAD application that you can download and install for free. It is available for major operating systems which includes Microsoft Windows and Linux. It is available in more than 20 languages and for major operating systems which includes Microsoft Windows and Linux.

The app is great for industrial designers, but anyone who wants to learn how to make 2D CAD drawings will like this program. For a free software, eCAD gives you a lot of tools to work with. New users will be able to create basic drawings, while advanced users can make engineering plans with the software.You can start drawings from scratch. But it is also easy to put in ellipses, arcs, lines and circles. eCAD also has a powerful zoom tool that lets you look at models at dierent distances. This is essential for designers who are going to make life size copies of a drawing. eCAD also has grids which are extremely useful for those new to CAD. Once you have made the basic object, you can customize it in many ways. Scaling is particularly easy here. Also Dimensioning which is must in every CAD software is there. We can calculate the distance between two points and can get the size of the object. Here, its worth mentioning about snapping part. We can have snapping to grid, center etc. One if wants to work by writing a code can do so in scripting feature. You can download and install eCAD freely, with no fear of copyright infringement.

1.2 License

The GNU General Public License is a free, copy left license for software and other kinds of works. The licenses for most software and other practical works are designed to take away your freedom to share and change the works. The GNU General Public License is a free, copy left license for software and other kinds of works. The licenses for most software and other practical works are designed to take away your freedom to share and change the works.

Figure 2: GPLv3

Then we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs, and that you know you can do these things. For example, if you distribute copies of such a program, whether gratis or for a fee, you must pass on to the recipients the same freedoms that you received. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights. Developers that use the GNU GPL protect your rights with two steps:

- assert copyright on the software
- oer you this License giving you legal permission to copy, distribute and/or modify it.

For the developers and authors protection, the GPL clearly explains that there is no warranty for this free software. For both users and authors sake, the GPL requires that modied versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

For the developers and authors protection, the GPL clearly explains that there is no warranty for this free software. For both users and authors sake, the GPL requires that modied versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it eectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

2 Installation

To access the eCAD we need to follow few steps. There are also basic requirements which we need to have to run eCAD. As it works onn both Windows and Ubuntu. So we have dierent process for both.

2.1 For Linux

1. Downloading
   - Install Qt libraries using sudo apt-get install qtdeclarative5-dev qt5-default
   - Download zip folder of eCAD or clone it from https://github.com/GreatDevelopers/eCAD
2. Installing
   - cd eCAD
   - qmake
   - make
   - ./eCAD

2.2 For Windows

1. **Downloading**: Download zip folder of eCAD from https://github.com/GreatDevelopers/eCAD
2. **Installing**: Install Qts latest version available with mingw compiler from Qts official downloads. After installation launch Qt creator load eCAD.pro, from the build menu select Build Alland Run.

3 Interface

3.1 Menubar

In eCAD we have menubar. In menubar it contains different menu items and sub menuitems. Each menuitem has its own specific requirement and advantage. Each menu item is described as below:

Figure 3: Menubar

1. **File Menu**: It contains following submenus.
   - New: On clicking this menuitem we can create a new document. The shortcut key to is Ctrl+N
   - Open: This is used to open a file which was already saved, so that we can edit that file as per user requiremenet. The shortcut key is Ctrl+O
   - Save: On clicking this we get our file save in xml format. The shorcut to this is Ctrl+S
   - Save As: When one wants to save the file with different name. He/She can do so with Save As functionality. The shorcut to it is Ctrl+Shift+S
   - Import: Using this one can import the file from outside souce. One can import jpg and png images in eCAD
   - Export: Also once file is made need to be exported. In eCAD one can export the file in the pdf, jpg and png format.
   - Close: On clicking this the current document gets close.
   - Print preview: Before printing user may want to view the file to print. This can be done by clicking on it or by pressing Ctrl+Shift+P
   - Print: To print the file click on it or press Ctrl+P.
   - Quit: To quit or close the software click on it or press Ctrl+Q
2. **Edit Menu**: It contains following submenus
   - Cut: To cut the item click on this or press Ctrl+X
   - Copy: To copy the item click on this or press Ctrl+C
   - Paste: To paste the item click on this or press Ctrl+V
   - Undo: To Undo click on it or press Ctrl+Z
   - Redo: To Redo click on it or press Ctrl+Shift+Z
3. **View menu**: It contains following submenus
   - Grid: On clicking this Grid appears and disappears
   - Zoom In: On clicking this the view gets zoom in
   - Zoom out: On clicking this the view gets zoom out
   - Panning: One can move the screen using this feature

- Status Bar: This shows the current screen position and also what to do next after clicking on entities.
- Tool Bar: It futher have submenus for toolbar, scripting widgets and console mode.

4. **Select**: It contains following submenus
   - Select all: This will select all the entities
   - Deselect all: This will deselect all entites
   - Select Window: This will select full window
   - Select entity: This will allow to select one entity
   - Deselect window: This will deselect window
   - Invert Selection: This will invert the selection.
5. **Draw**: It contains following submenus
   - Points: It is used to add points.
   - Line: It is used to draw Line
   - Circle: It is used to draw Circle
   - Ellipse: It is used to add the ellipse
   - Arc: It is used to add the arc
   - Text: It is used to add the text
   - Image: It is used to add the image
6. **Modify** : It contains following submenus.
   - Delete selected: It will delete the selected items.
   - Delete entity: It will delete the single entity.
7. **Dimension**: It contains following submenus
   - Horizontal: It will add the horizontal dimension.
   - Vertical: It will add the vertical dimension.
8. **Snap**: It contains following submenus
   - Free: It will be free snap.
   - Grid: It will be for snap to grid.
   - Center: It will be for snap to center
   - Middle Points: It will be for snap to mid points
   - End points: It will be for snap to end points
9. **Help**: It contains following submenus
   - Manual: It will open the manual of the eCAD.
   - About: It will about page of eCAD.

3.2 Toolbar

Figure 4: Toolbar

Toolbar contains the shortcut of the various items in menubar. Like new, open, save, close, undo, redo etc. There are two toolbar standard toolbar and main toolbar.

1. **Main Toolbar**

 This creates a new Document.

 This opens a document.

 This saves a document.

 This cuts the selected entity.

 This copies the selected entity.

 This paste the entity at the position.

 This undo the previous action.

 This redo the previous action.

2. **Standard ToolBar**

 This will create points

 This will create line

 This will create circle

 This will create ellipse

 This will create arc

 This will create a box to insert text

 This will insert image

3.3 Working Space

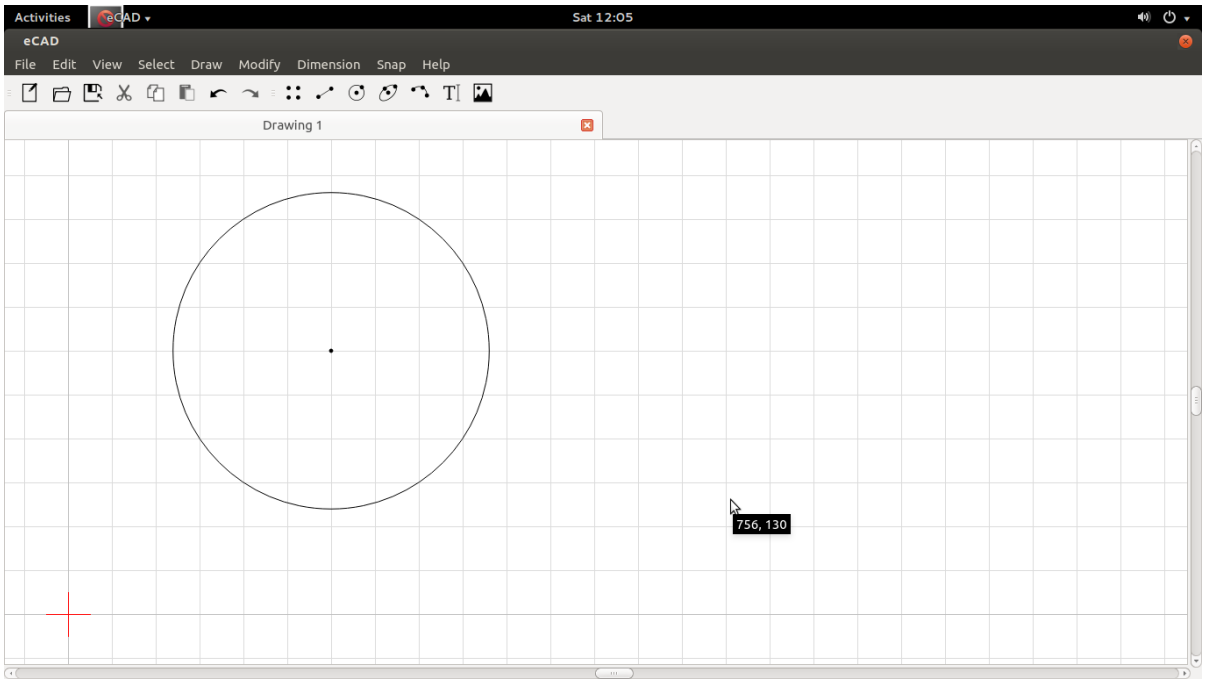


Figure 5: Working Space

This is the working space where all the entities are drawn. We can increase or decrese the working area by closing or opening the widgets like scripting console and status bar. At present the are closed. This is the maximum area one will get to work. One can also make more than one document so that he/she can work easily. All depends upon user need.

3.4 Scipting Console

In scripting console user can write the script/code to draw the drawing. So this feature is effective for technical user, who is excited and want to code. The code for each entity is very simple. There are different icons of in scripting. Each have its different meaning.

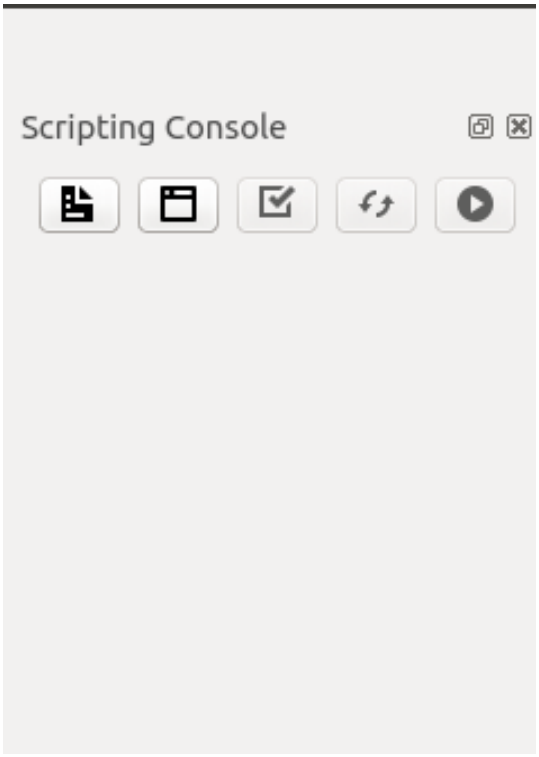


Figure 6: Scripting console

 This will create a new document in scripting console.

 This will load an existing script

 This will save the script which is written.

 This will clear the existing script.

 This will execute the current script.

3.5 Status Bar

Figure 7: Status Bar

The status bar tells us aout two things

- Current screen position
- What to do next while making an entity through UI part.

4 CAD documents

4.1 Creating a new document

There are different ways in which we can create a new document. Either from the file menu, from toolbar or by using the shortcut keys.

1. **From File Menu**: Go to File then New a new document will be created.

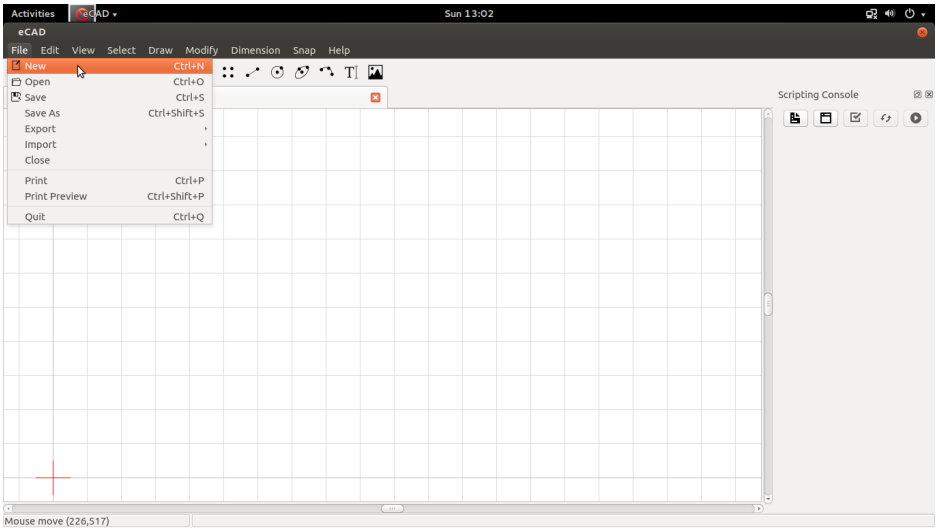


Figure 8: New Document from file menu

2. **From toolbar**: Click on the icon for new document. It will be created

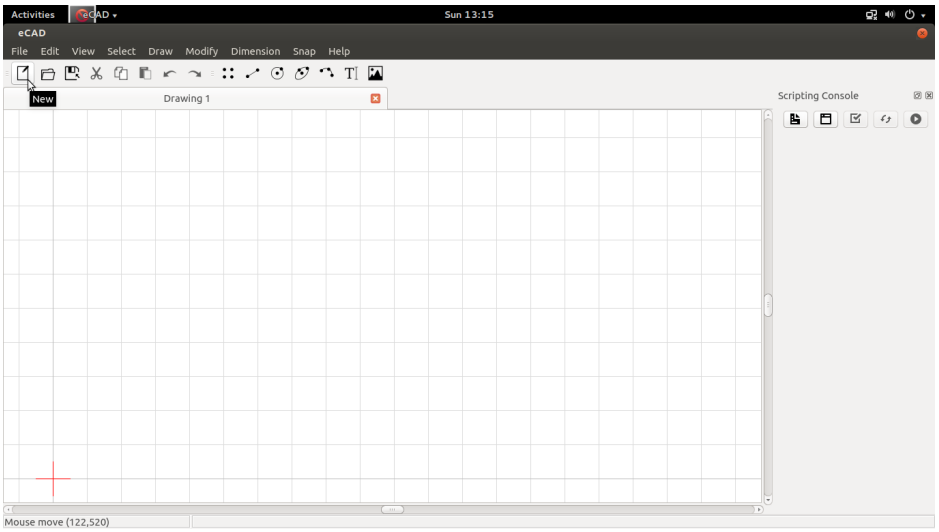


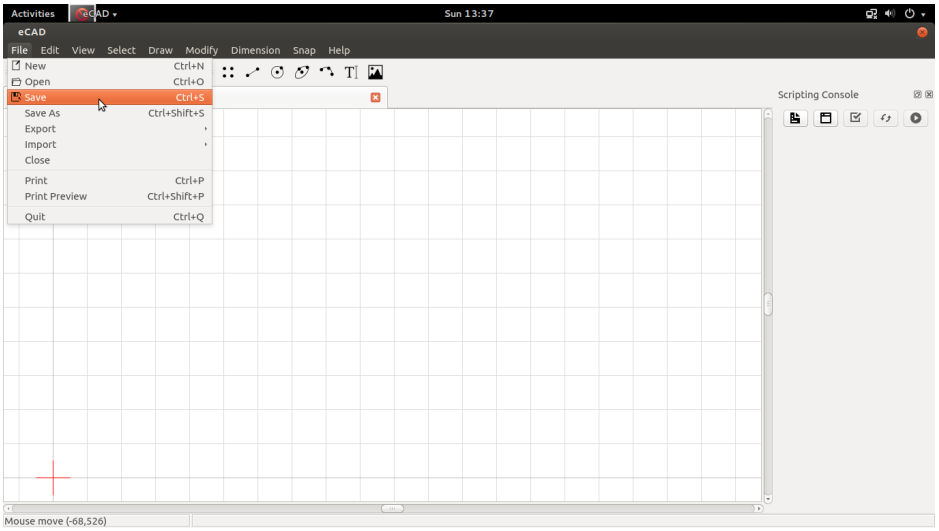
Figure 9: New Document from toolbar

3. **From Shortcut**: Press Ctrl+N a document will be created.

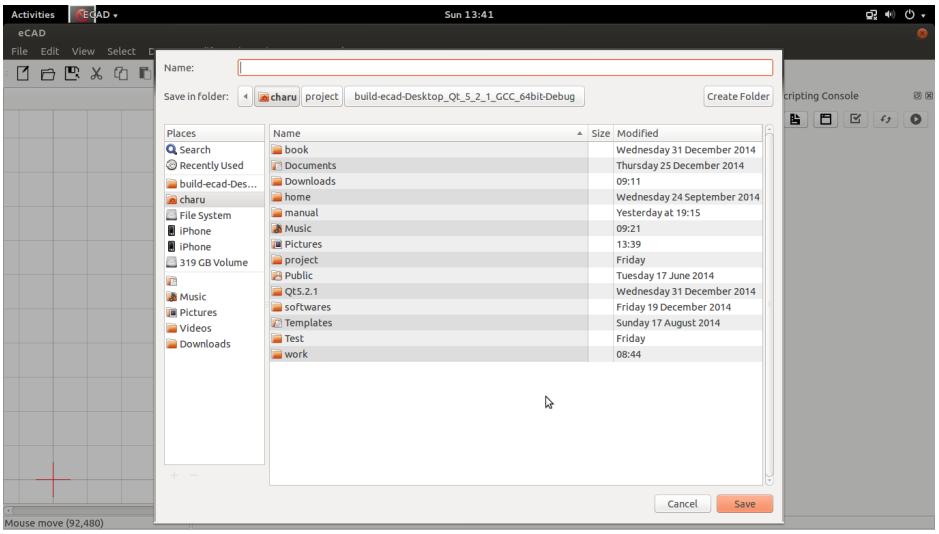
4.2 Saving a Drawing

We can save the drawing either from file menu or by using shortcut.

1. **From File Menu**:



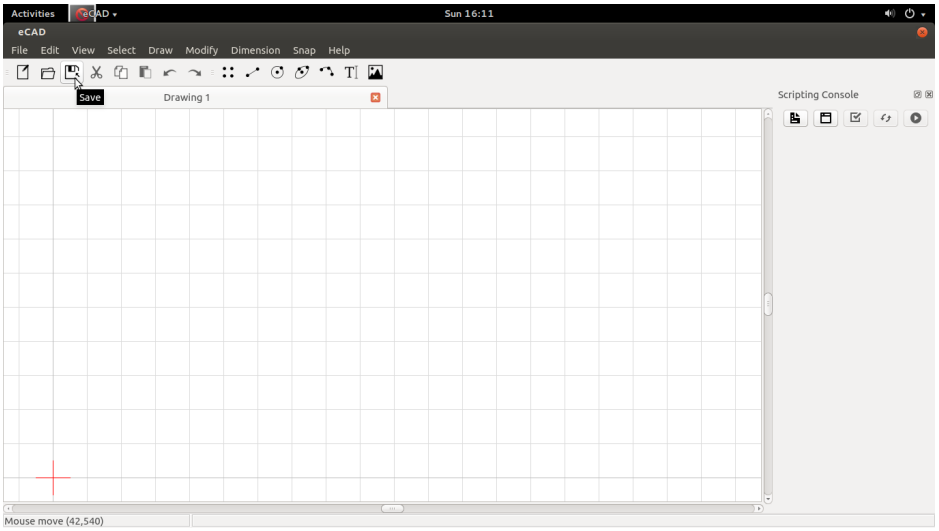
Click File then Save



A dialog box will open then click save.

2. **From Toolbar**: Click on the icon in the toolbar to save the file a dialog will open then click save to save he file.

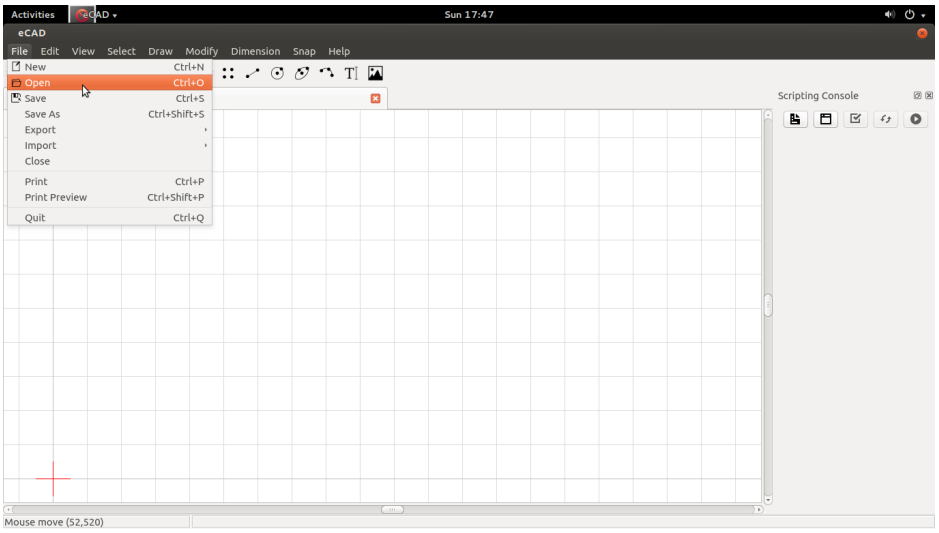
3. **From Shortcut**: Press Ctrl+S to save the file.



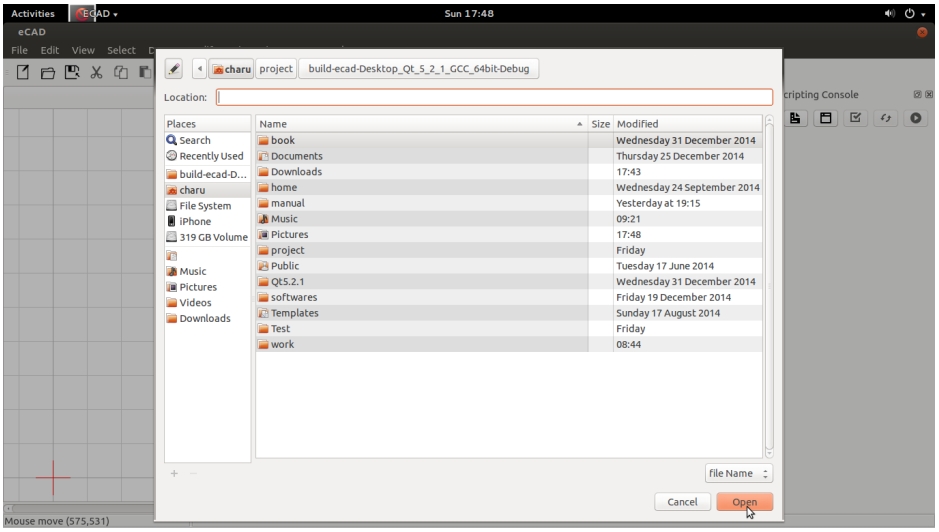
4.3 Opening a Document

We can open the Drawing from menu bar, tool bar or by using shortcut.

1. **From File Menu**:

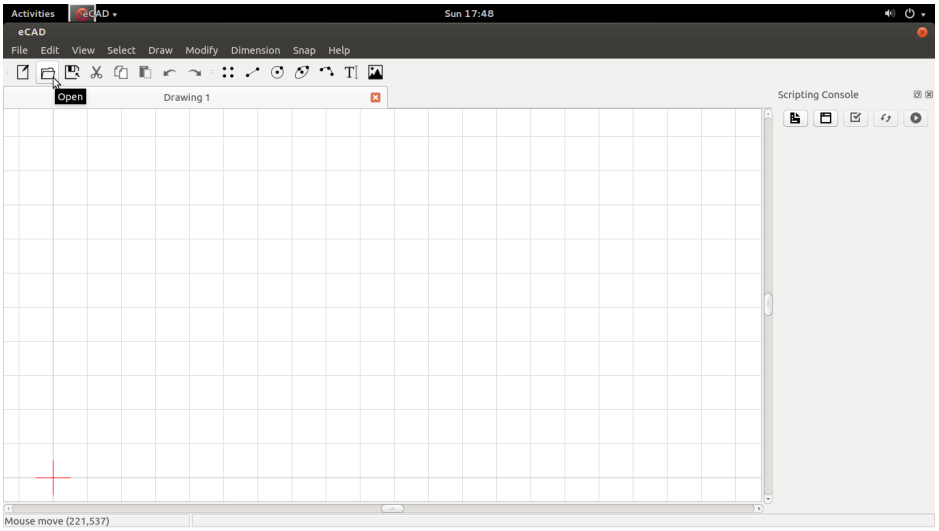


Click File then Open



A dialog box will open then click open.

2. **From Toolbar**: Click on the icon in the toolbar to open the file a dialog will open then click open to view the file.



3. **From Shortcut**: Press Ctrl+O to open the file.

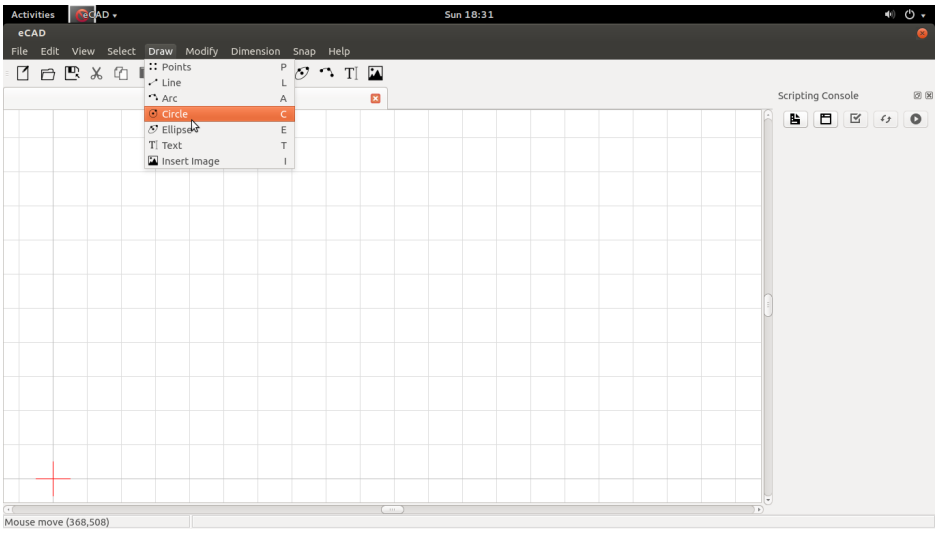
ar

5 Creating Entities

There are various ways in eCAD to draw entities. One can draw entities using draw menu, toolbar, shorcuts or commands. Each way is explained in detail as follows:

5.1 Draw Menu

We can draw the each entity using draw menu whether its point, line, circle, arc, ellipse, text or image. The way for each entity is described below.



1. **Point**
   - Click on point in Draw menu
   - Then click anywhere on working space
   - This will create the point at that location.
2. **Line**
   - Click on line in Draw menu
   - Then click first point on working space.
   - Set the second point of line.
   - This will create the line at two points.
3. **Arc**
   - Click on arc in Draw menu
   - Click the start point of the arc
   - Then second click will create any point on the arc
   - Third click will create the end point of the arc
   - This will create our arc
4. **Circle**
   - Click on circle in Draw menu

- Then click on working area, this will create center point of arc
- Second click will create any point on the circle and using first and second click radius of circle is calculated
- This will create a circle.

5. **Ellipse**
   - Click on point in Ellipse menu
   - Then click on graphics view this will create a center point of ellipse
   - After second click minor radius is calculated
   - After third click major radius is calculated
   - Finally ellipse is calculated
6. **Text**
   - Click on text in Draw menu
   - Then click anywhere on working space
   - This will create a text box in which we can enter the text
7. **Image**
   - Click on image in Draw menu
   - A dialog box will open, select an image to be inserted in it.
   - Then set the image where you want to set.

5.2 Toolbar

Also we can draw the entities using the toolbar. The entities are in standard toolbar.

1. **Point**

   - Click on above icon in toolbar
   - Then click anywhere on working space
   - This will create the point at that location.
2. **Line**

- Click on above icon in toolbar
- Then click first point on working space.
- Set the second point of line.
- This will create the line at two points.

3. **Arc**

- Click on above icon in toolbar
- Click the start point of the arc
- Then second click will create any point on the arc
- Third click will create the end point of the arc
- This will create our arc

4. **Circle**

- Click on above icon in toolbar
- Then click on working area, this will create center point of arc
- Second click will create any point on the circle and using first and second click radius of circle is calculated
- This will create a circle.

5. **Ellipse**

- Click on above icon in toolbar
- Then click on graphics view this will create a center point of ellipse
- After second click minor radius is calculated
- After third click major radius is calculated
- Finally ellipse is calculated

6. **Text**

   - Click on above icon in toolbar
   - Then click anywhere on working space
   - This will create a text box in which we can enter the text

7. **Image**

   - Click on above icon in toolbar
   - A dialog box will open, select an image to be inserted in it.
   - Then set the image where you want to set.

5.3 Shortcuts

We can even create the entities using the shorcut keys.

1. **Point**
   - Press P.
   - Then click anywhere on working space
   - This will create the point at that location.
2. **Line**
   - Press L
   - Then click first point on working space.
   - Set the second point of line.
   - This will create the line at two points.
3. **Arc**
   - Press A
   - Click the start point of the arc
   - Then second click will create any point on the arc
   - Third click will create the end point of the arc
   - This will create our arc
4. **Circle**
   - Press C
   - Then click on working area, this will create center point of arc

- Second click will create any point on the circle and using first and second click radius of circle is calculated
- This will create a circle.

5. **Ellipse**
   - Press E
   - Then click on graphics view this will create a center point of ellipse
   - After second click minor radius is calculated
   - After third click major radius is calculated
   - Finally ellipse is calculated
6. **Text**
   - Press T
   - Then click anywhere on working space
   - This will create a text box in which we can enter the text
7. **Image**
   - Press I
   - A dialog box will open, select an image to be inserted in it.
   - Then set the image where you want to set.

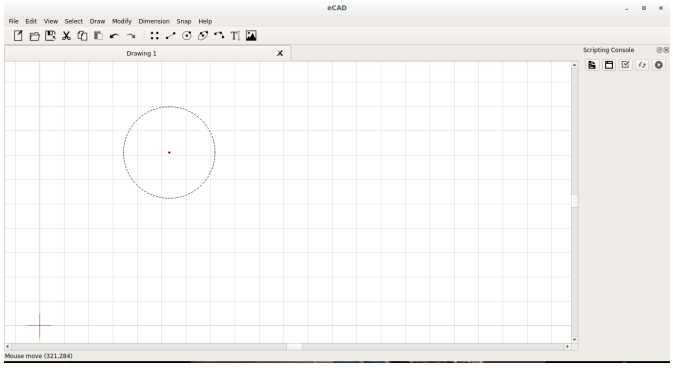
6 Selecting Entities

eCAD also provides the option to select the entities. User may select the entities either through the mouse clicks or through the Select Menu.

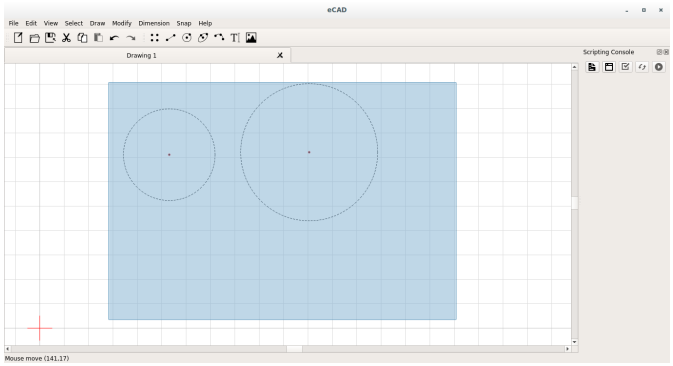
6.1 Using Mouse

eCAD allows the user to select one or multiple entities.

1. **Selecting single entity:** User may select single entity by simply clicking on that entity.



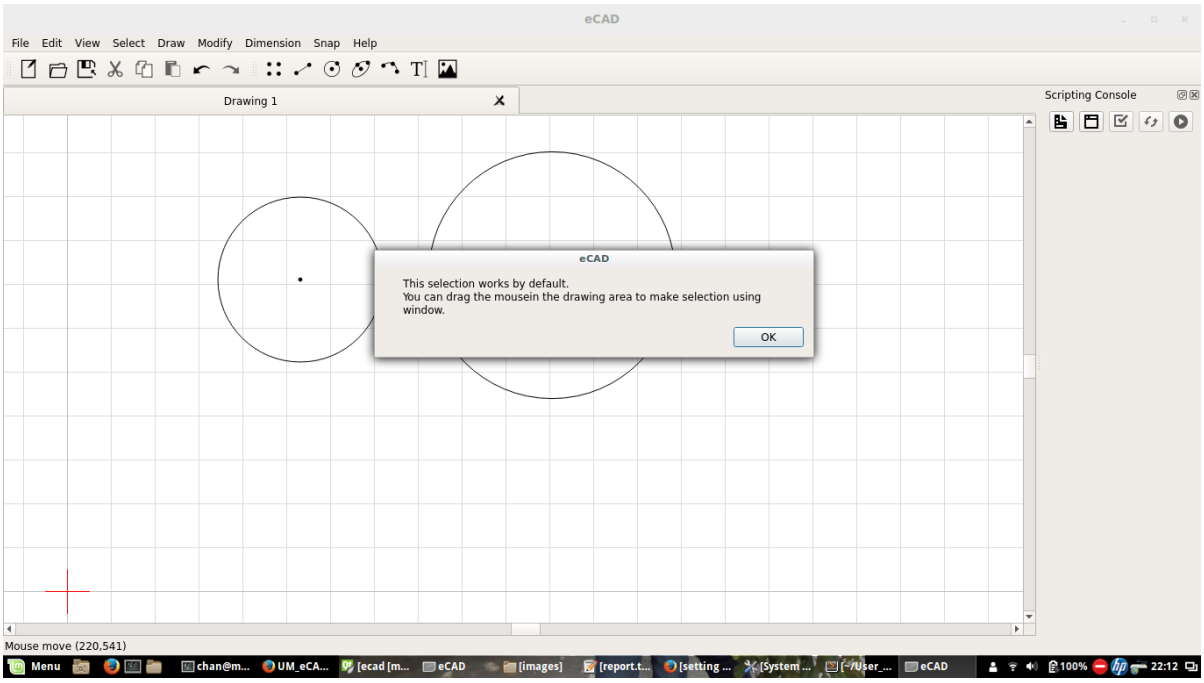
2. **Selecting multiple entities:** Dragging the mouse over the entities will allow one to select them.



6.2 Select Menu

Select Menu provides various options to select the entities. Select menu options are explained below:

1. **Select All:** This option allows to select all the entities that are currently present on the workspace.
2. **DeSelect All:** This option allows to deselect all the entities that were currently selected.
3. **Select Entity:** This option is valid for the single entity that provides user to select the entity, if there is only one entity currently visible.
4. **Select Window:** Clicking this option would give a user a message to drag the mousein the drawing area to make selection using window and you may drag the mousein to make selection.



5. **DeSelect Window:** This would allow the user to deselect the entities, selected using Select Window.

6. **Invert Selection:** Invering selection will make selected entities deselected and vice versa.

7 Operations

There are various operations that are performed in eCAD.

7.1 Move

One can move the entity from one location to other according to user requirement. One can also move multiple entities from one location to another. Also the coordinates of entites are also changed when an object is moved from one place to another.

7.2 Cut, Copy and Paste

Cut, Copy and paste are one of the important features which need to be embended in any cad software. Without this any software is incomplete. We can either perform above actions from context menu or file menu.

1. **From Context Menu**
    - Cut: To cut select the entity and right click on that entity then select cut.
    - Copy: To copy select the entity and right click on that entity then select copy.
    - Paste: To paste the entity right click and select paste.
2. **From Edit Menu**
    - Cut: To cut select the entity and then select cut.
    - Copy: To copy select the entity and then select copy.
    - Paste: To paste the entity select the position on screen then select paste.

7.3 Delete

We can delete the entity either by using keyboard keys or from Menu.

1. **From keyboard keys**: Select an entity then press delete key.
2. **From Menu**: Select the entity then press delete from delete menu.

7.4 Undo/Redo

We can undo redo either by using shortcuts or from edit menu

1. **From edit menu**
    - Undo: Click on undo to undo the previous action
    - Redo: Click on redo to redo the action.
2. **From Shorcuts**
    - Undo: Press Ctrl+ Z to undo the previous action
    - Redo: Press Ctrl+Shift+Z to redo the action.

8 Actions in eCAD

8.1 Panning and Zooming

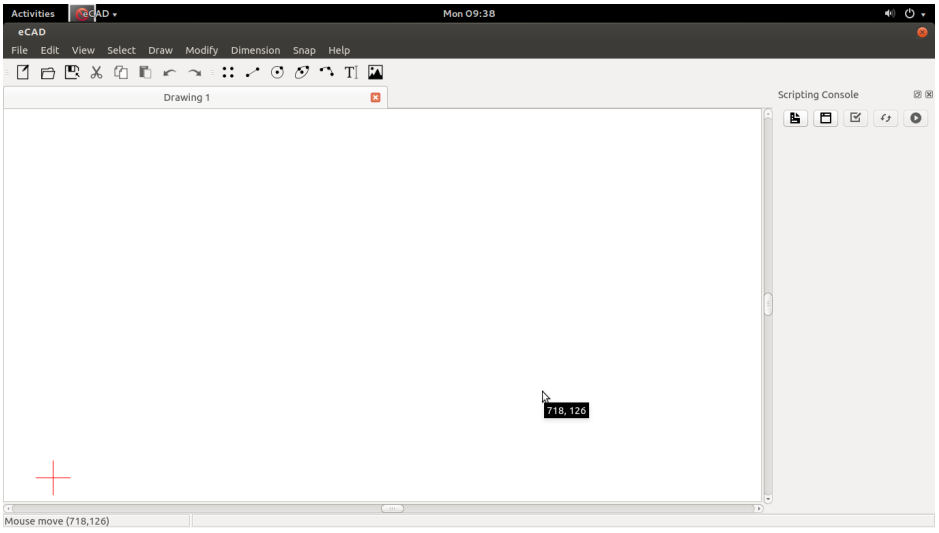
Pan and zoom are very useful tools in eCAD. The zoom tool is invaluable when you need to move up close to an entity to work on it. This is especially true when the area is very small, or several lines drawn close together. As you will see in a moment, there are several ways to use zoom. Pan allows you to move the drawing up, down, right, or left. This is especially useful if your drawing is large. Pan and zoom are accomplished by two methods. Either from the menu or using cursor.

1. **From Menu**
   - Zoom In: Go to View then click Zoom In to zoom.
   - Zoom Out: Go to View then Click Zoom Out to zoom.
   - Panning: Go to view then click Panning, hand cursor will appear now you can move the screen as you want to do that.
2. **Using cursor**: Zooming can be achieved by mouse wheel scrolling. By default, wheel scrolling triggers zooming-in/out respectively.

8.2 Toggling Visibility

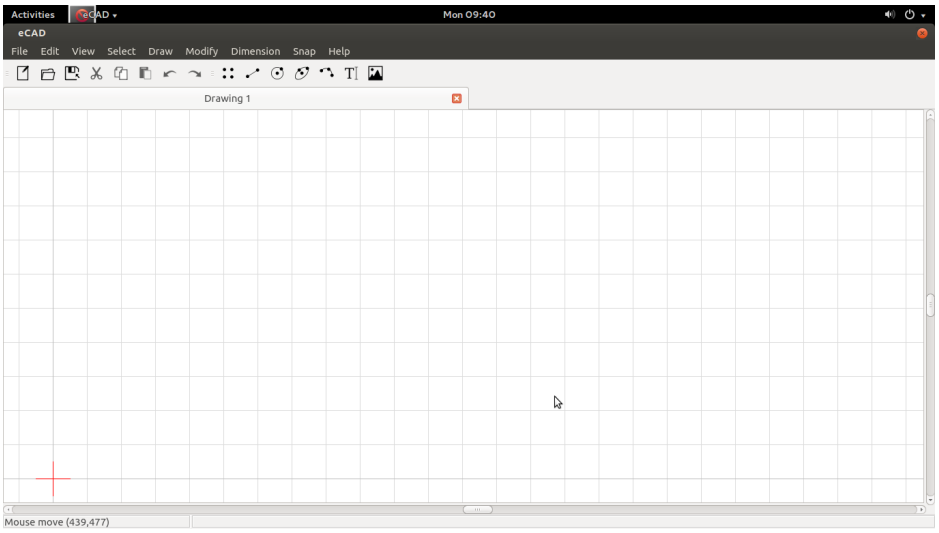
There are various which we can set according to our requirement. Like grid, scripting console, command console, status bar, tool bar etc. It all depends upon user need how user want to see the screen.

1. **Grid**:



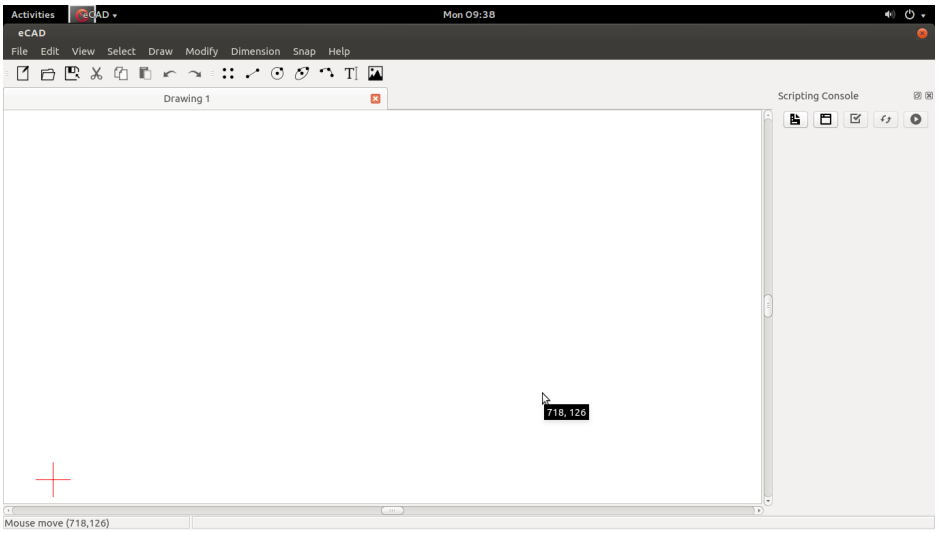
Go to View the uncheck the grid Grid will not be visible.

2. **Scripting Console**:



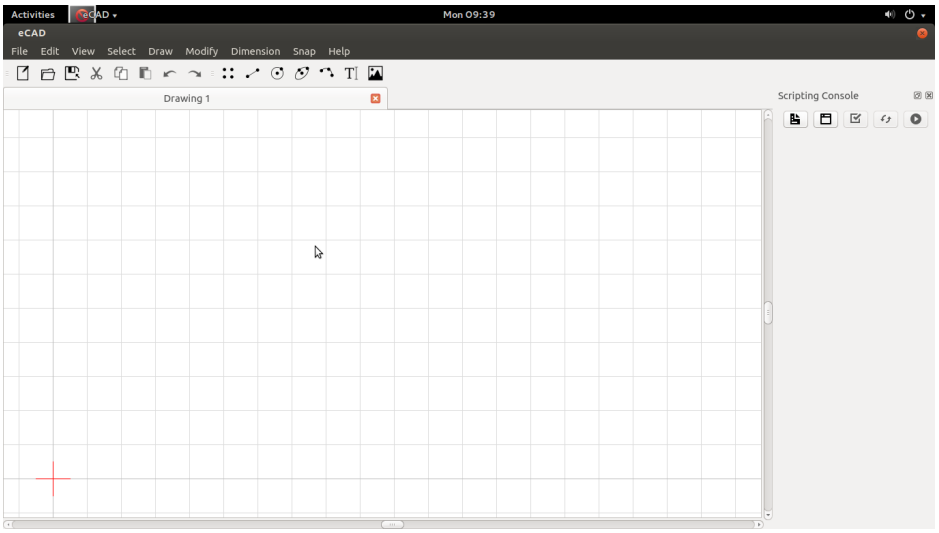
Go to View then Toolbars and uncheck the scripting. Scripting widget will get closed.

3. **Command Console**:



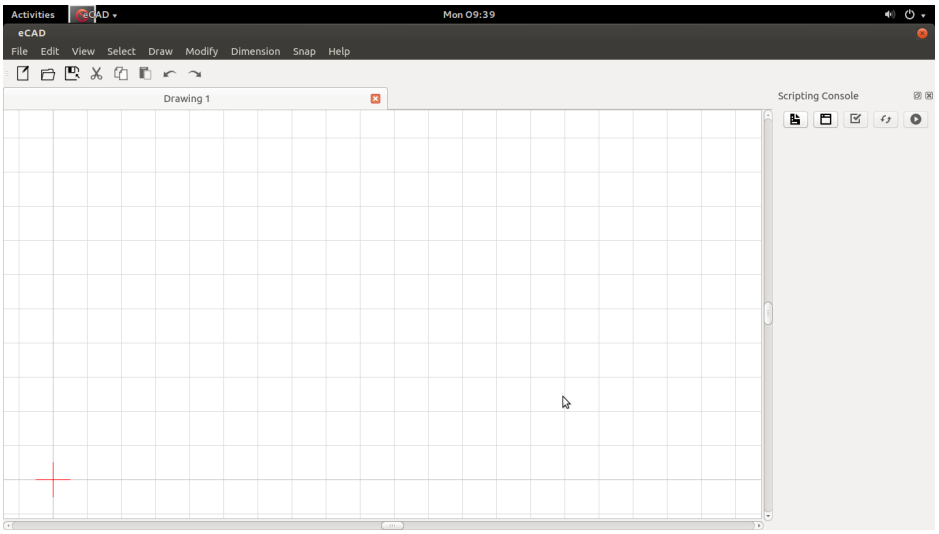
Go to View then Toolbars and check the command console it will be visible. By default command console is unchecked

4. **Status Bar**:



Go to View and uncheck the status bar the status bar will not be visible

5. **Tool Bar**:



Go to View then Toolbars and uncheck the toolbar the standard toolbar which contains all the entities will not be visible.

9 Scripting

A script is a macro, a list of commands that you can run all at once, and as many times as necessary, allowing you to automate tasks that would take a long time if you did them manually. Scripts can be very powerful and you can run them on objects in one drawing, or on many drawings. Scripts have been around for many years and many people have a library of many scripts that they use.

- First step for scripting is to create a script file. Click on new icon in scripting console
- A dialog box will open save that file with .js extention
- Start writing the script
- After writing the script click on execute icon. This will create a drawing in the drawing area.

There are various commands for each entity. Different commands for different entities. They are almost similar difference is in the parameters which we have to pass for scripting. Let's discuss each command in detail.

9.1 Point

To create a point type cad.point(x coordinate, y coordinate).
For example cad.point(500,300). Then execute it a point will be made.

9.2 Line

To create a line cad.line(start x coordinate, start y coordinate, end x coordinate, end y coordinate).
For example cad.line(150,100,200,210);

9.3 Circle

To create an arc cad.circle(center x coordinate, center y coordinate, radius).
For example cad.circle(50,50,30);

9.4 Ellipse

To create an ellipse cad.ellipse(center x coordinate, center y coordinate, major radius, minor radius).
For example cad.ellipse(50,50,60,30);

9.5 Arc

To create an arc cad.arc(start x coordinate, start y coordinate, end x coordinate, end y coordinate).
For example cad.arc(120,130,233,321,456,546);

9.6 Text

To create text cad.text(start x coordinate, start y coordinate, text)
For example cad.text(420,520,hello);

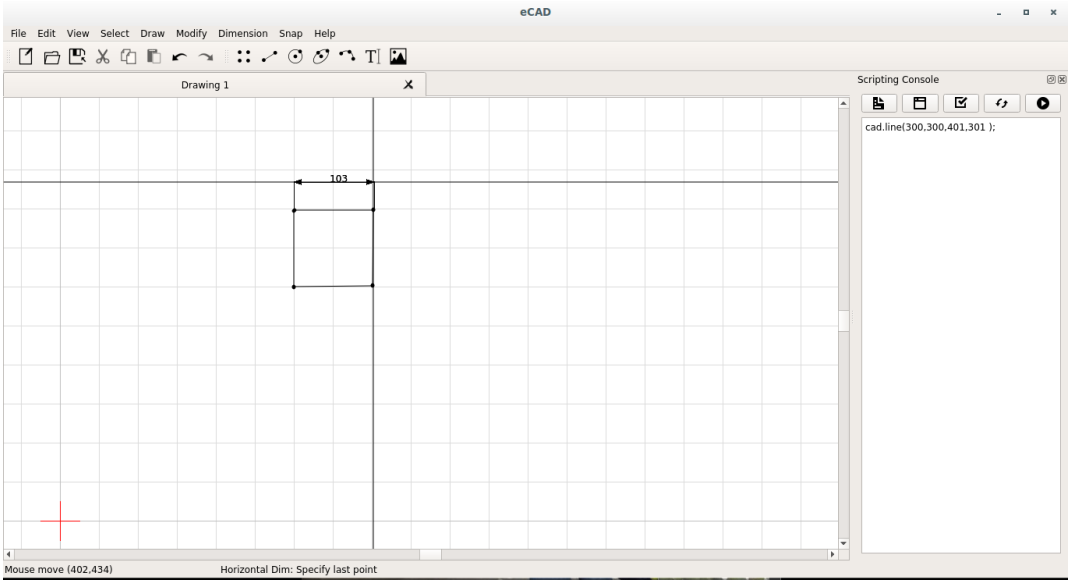
10 Dimensioning

Following section describes the options available for dimensioning drawings and how to use them. eCAD provides range of dimensioning tools which can be used to quickly dimension any drawing. eCAD divides dimensions into three main categories: Horizontal, Vertical, Diametric Radial. The first two options are for dimensioning lines and the next two are for the circles/arcs. These options are available in the menubar under the Dimension menu.

10.1 Horizonatal Dimensioning

To start with, just create a drawing. So let's start

1. Click File and then New. Save the File.
2. The first thing is to draw a simple object so that we can dimension it. Let us draw a square.
3. Select Horizontal from the Dimension menu.
4. Move the cursor over either the left top point or bottom left point of your square and click once.
5. Now move the cursor horizontally to the right to the right edge of the square and click once.
6. Without clicking the mouse move the line up or down a you will notice the dimension appears. You can now place it where you want to and when you are satisfied click one time to set it.



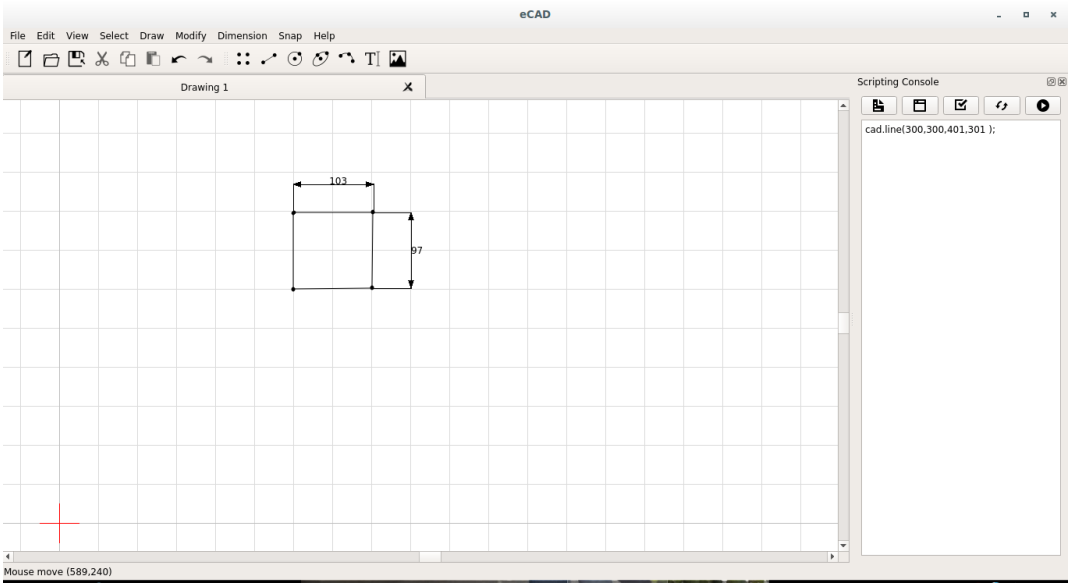
10.2 Vertical Dimensioning

You may follow the steps below for vertical dimensioning. We will dimension the above drawn square now vertically

1. Select Vertical from the Dimension menu.
2. Select upper left point of the square and click once.

3. Move the cursor vertically downwards and click once the bottom left point of the square.

4. Without clicking move your mouse to the right and the vertical dimension. appears. Move it where your want it and click once and now you have dimensioned the square.



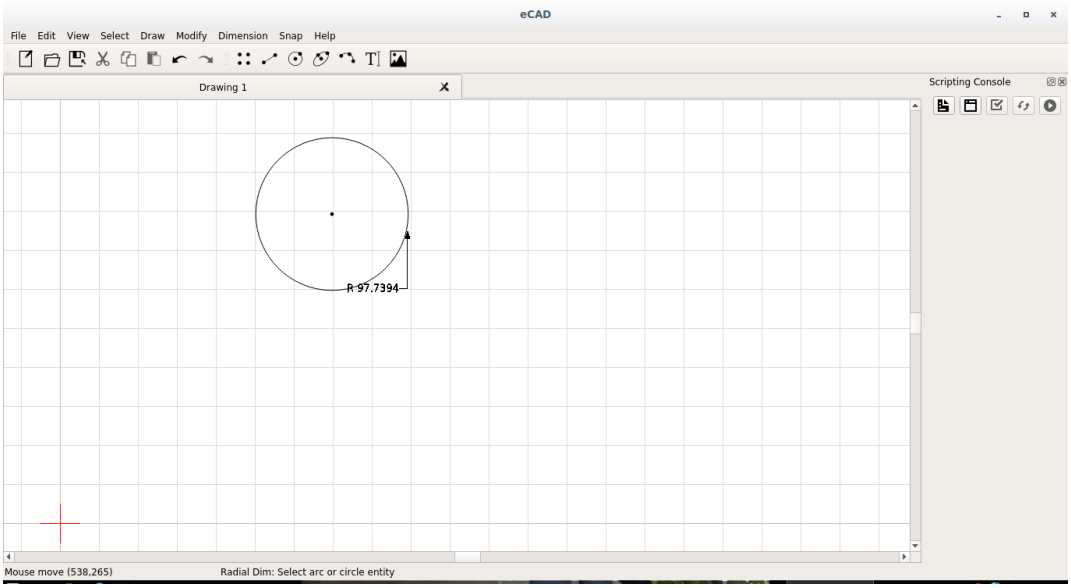
10.3 Radial Dimensioning

Begin by drawing a circle.

1. Select Dimension and click Radial from the Dimension Menu.

2. Touch the edge of the circle with your cursor and click once.

3. Without clicking your mouse, move it away from the circle. Notice the dimension appears. Now move the around the circle and you will see the dimension moves around the circle. Pick a spot you want your dimension and click once.



10.4 Diametric Dimensioning

It Creates diametric dimensions for circle or arc entities and similarly set the position of the diametric dimension line using the mouse.

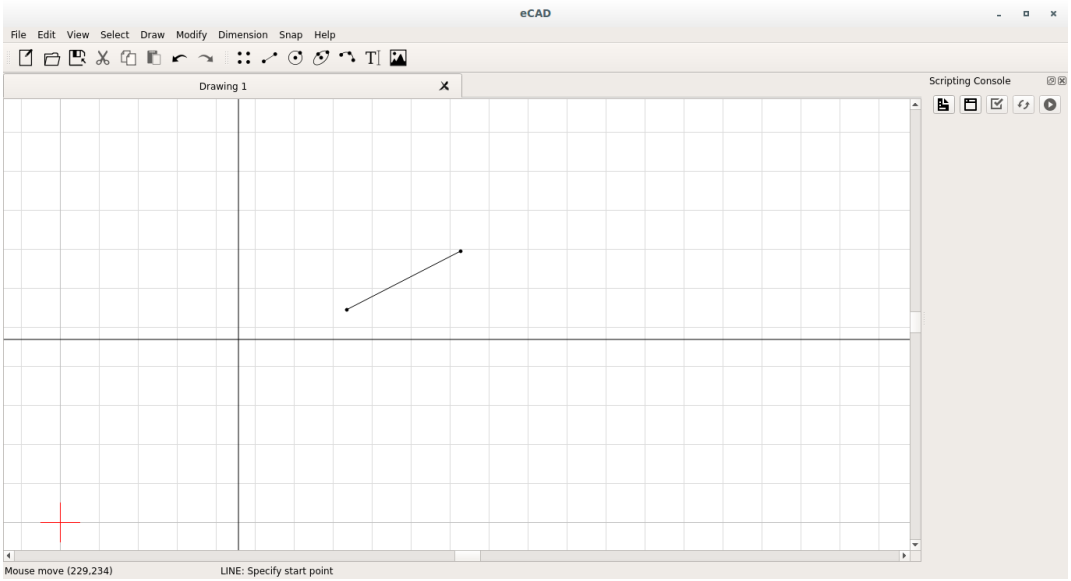
11 Snapping

Snap mode restricts the movement of the cursors to the points that you define. When Snap mode is on, the cursor seems to adhere, or "snap to that defined points. eCAD offers following snap modes, that you can find in Snap menu.

1. Free
2. Grid
3. End Points
4. Center
5. Middle Points

11.1 Free Snap

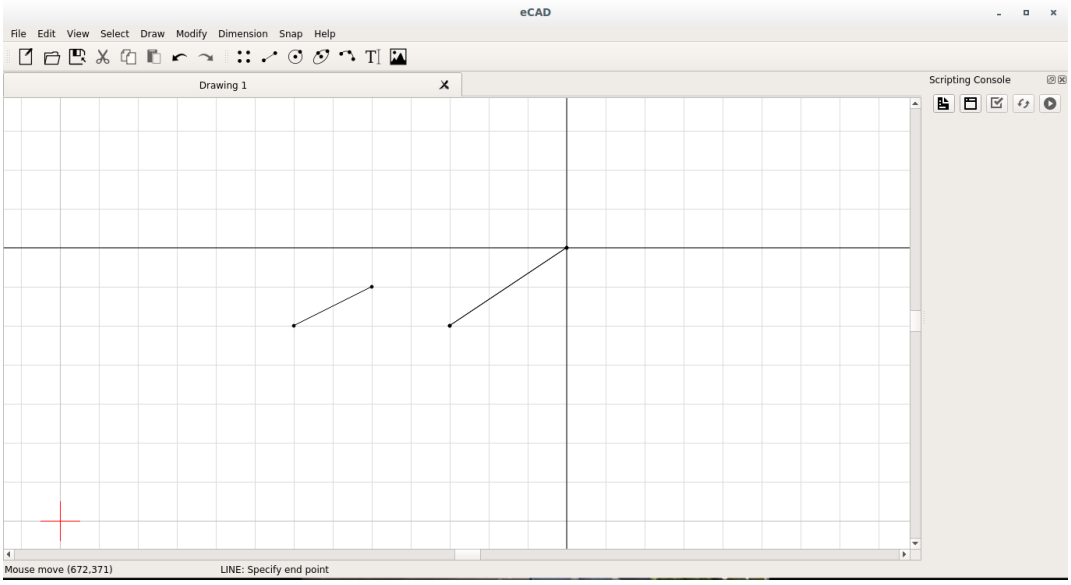
By default Free Snap mode is on/checked. In free snap you have no restrictions to draw on fixed points. It allows free positioning and your drawing is not stick to the particular points but allows you drawing freely.



11.2 Grid Snap

Snaps the object(s) to the nearest grid point.

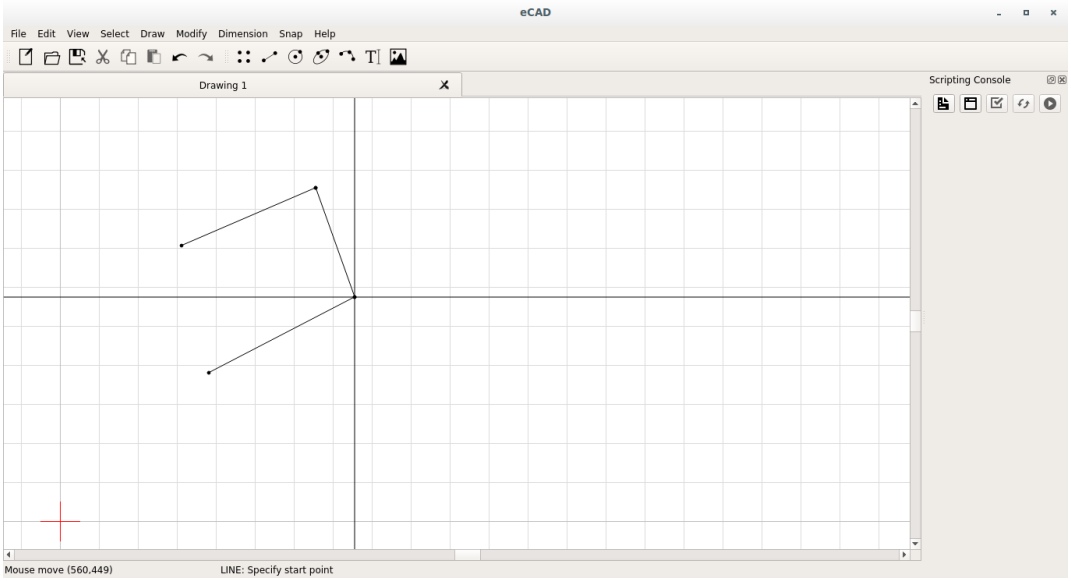
1. For Grid Snapping, check the Grid Snap from Snap pull-down menu.
2. Begin by drawing any entity.
3. You will notice that the grid almost seems magnetic, when you draw any object, the grid points appear to pull on it when it approaches.



11.3 End Points

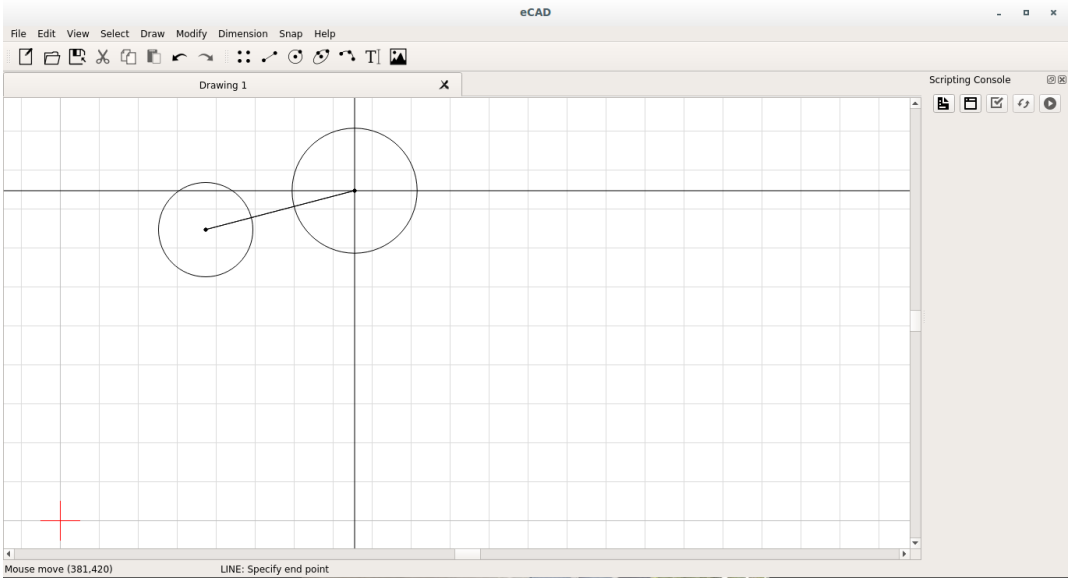
This snaps used to get to the exact endpoint of a line, arc or other object that has a definite ending to it.

1. Begin by drawing a line.
2. Now, Draw the second line and turn End Points mode on.
3. You will notice that the cursor automatically is pulled towards the end points.



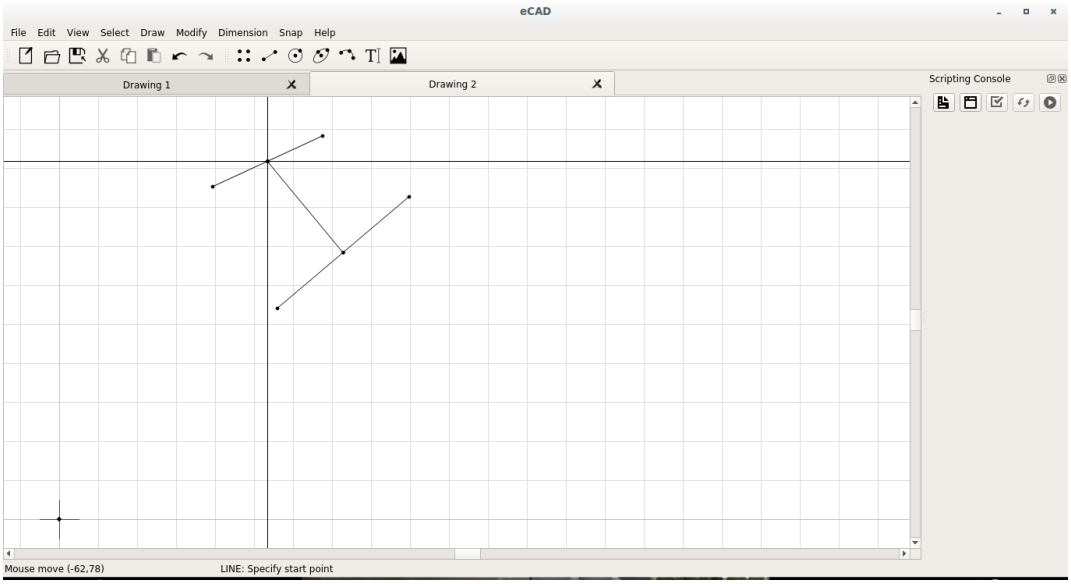
11.4 Center

The center snap is used to find the exact center of circles, arc and ellipses.



11.5 Middle Points

This is used to find the exact middle of any object that has a beginning and an end. All lines and arcs have a midpoint. (Circle have a center, not a midpoint.)



12 Help

The Help menu provides two options:

1. Manual
2. About

12.1 Manual

This option will take you to the manual of eCAD, that you are currently reading.

12.2 About

This option would give you brief description of eCAD regarding license and developers.